PERSPECTIVES on Science and Christian Faith

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In this issue . . .

"The fear of the Lord is the beginning of Wisdom."
Psalm 111:10

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Perspectives on Science and Christian Faith

MANUSCRIPT GUIDELINES

The pages of *Perspectives* are open to any contribution dealing with the interaction between science and Christian faith in a manner consistent with scientific and theological integrity. Papers published in *Perspectives* do not reflect any official position of the American Scientific Affiliation.

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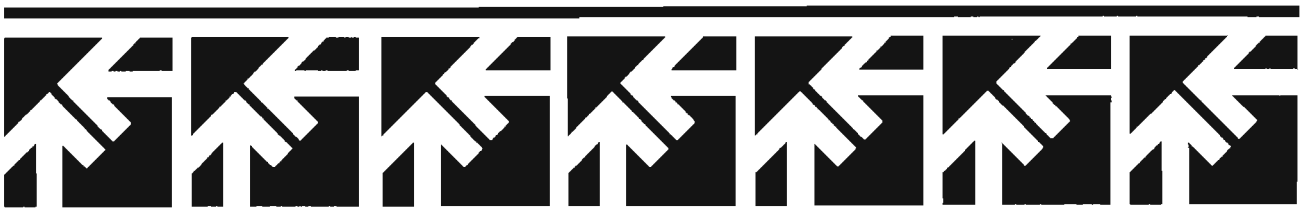

Putting Things Into Perspective

Robert John Russell opens this issue with an eloquent account of his personal odyssey to the leadership of the Center for Theology and the Natural Sciences at Berkeley. Bob's spiritual and educational experiences parallel those of many of us and offer challenge and encouragement to younger readers who are experiencing the same rites of passage. He offers pointed commentary on various questions in modern physics and words of encouragement to those who seek to bring together the religious and scientific cultures.

Sorting out the events of the past has been an enduring and often unproductive quest on the part of the scientific community. In his article, biochemist Gordon Mills examines the scientific presuppositions of workers in the field of 'chemical evolution.' He warns of the speculative nature of origin research and argues that God must be taken into account when addressing presuppositional questions.

Christians in making ethical judgments may feel that they must make choices between what they view as an absolute norm and a relativistic ethic which appears to have shifting foundations. In siding with the absolutist approach, there is a tendency to understate the complexity of a situation. Those who probe more deeply may, as author Richard Bube suggests, be accused of "sliding down the slippery slope from initial inconsistency to ethical chaos." In seeking to address this tension, Bube argues that we need to evaluate particular cases from a viewpoint which emphasizes appropriate human compassion, distinguishes between biological and personal life, appreciates the realistic limits of responsible action and offers compassion without opening the door to injustice. He characterizes this approach as illustrating the "Spirit-guided maturity of Galatians 3:23-25." Application is made to central questions of "life and death."

Evangelicals have always talked and sung of peace, yet have paid little scholarly attention to its antithesis—oppression—until the last decade. Sociologist Lowell Noble outlines some recent thought and examples of Christian efforts to promote the cause of justice in this life. He gives high marks to the charitable works of the modern evangelical church but feels it continues to lag in promoting specific social reforms and, more fundamentally, "reconstruction of the entire society, a revolution of values."

With this issue we offer a new category of communication: "Dialogue." Here we encourage discussion of important questions in a way that allows a more rapid turnaround than Papers and Communications, yet more space (one to three pages) than that allotted for Letters to The Editor. We invite the reader to both *initiate* and *continue* "Dialogue." Preference will be given to emerging issues and innovative approaches to old problems. Brian Fraser begins the dialogue with a counter to S. W. Hawking's book *A Brief History of Time.* Then, David F. Siemens, Jr., and Dick Fischer discuss Fischer's understanding of biblical passages cited in his March 1990 article "The Days of Creation: Hours or Eons?"

Richard Bube's "Word Maze" calls us to clarify our definitions of the familiar words "creation" and "evolution." He forcefully reminds the Christian of the dangers in misinterpreting these words in a desire to "defend the faith."

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These papers, articles, letters, and reviews come from a community concerned with viewing the world and its people from a Christian Perspective. We invite readers to participate in the discussion.

JWH

Christian Discipleship and the Challenge of Physics: Formation, Flux, and Focus

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The founder of the Center for Theology and the Natural Sciences offers an introspective autobiographical statement of his path to Christian faith, to physics, to theology, to teaching, and to leadership in the task of promoting dialogue between science and Christianity.

Journeys and Vistas

In the summer of 1981 my family and I returned home to California across the grasslands of South Dakota and Wyoming after three years of teaching in Minnesota. Our trip followed the trails that pioneers had forged over a century ago, people like my wife's great-great-grandmother, who, undaunted by the deserts and the Rockies, made it all the way to the far frontier and the Gold Coast. On that hot, dry trip I also learned about desert rivers. Unlike other rivers which get broader and deeper until they reach the welcoming ocean, desert rivers lose a slow battle with heat and sand until they finally dry up and vanish in the desert furnace. Many an inexperienced pioneer left bones behind on the gamble that the desert river would provide them the vital life-giving water for the journey West. Others made it all the way to the windy surf and glistening shores of the Pacific Ocean.

Memories of those early pioneers and the lesson of the desert river haunt me as a symbol of my life's journey. I too was returning to California to attempt something still on the frontiers of my mind: how to bring science and religion together in mutual and responsible dialogue in a culture where sacred and secular are split apart. With ever increasing intensity I brooded over the fate of those great streams of religious thought which have born and shaped Western civilization. Could they be brought once again to carry the hopes and visions of humankind and to irrigate a new vision of the cosmos that gives lasting meaning to human life? Or were these priceless traditions just another "endangered species," drying up like desert rivers in the scorching light of modern science, with its staggering claim to authority and knowledge and its stunning technological power.

Faith that God acts in history and nature, trust that God's providence sustains life and guides our destiny, hope in eternal life beyond the grave—these beliefs had once been compatible with and even flourished in our understanding of the physical and biological world. A God in whom "we live and move and have our being" made sense when the heavens wrapped around the world and humans were the center of the universe, when history had a beginning and marched towards a future of hope and fulfillment, when life was a divine gift and eternity awaited those who worked for justice and compassion.

But my generation was brought up on Apollo and the PC, Einstein and Crick, the Space Shuttle

This essay was the inaugural lecture in a series sponsored by the Chair of Judeo-Christian Studies at Tulane University in September 1988, and was originally published in the CTNS Bulletin, Vol. 8, No. 4, Autumn 1988.

and the Jarvis heart, DNA and relativity. Can religious beliefs still make sense in a world of Star Trek—and can we survive a world of Star Wars without religion's moral insight? Given our universe filled with over a billion galaxies each with billions of stars, surely life forms are likely to have evolved elsewhere, perhaps in large numbers. What meaning of any "cosmic" significance is there then to *homo sapiens* and the terrestrial religions we have spawned? If life is simply a biological inevitability on a fertile planet like ours, how can we claim it as a divine gift of the Spirit? What hope do we have in times of grief, illness and terror if death is no longer a step to a better world but a recycling of our atoms and molecules into the ecosystem of a planet which is itself merely a dust mote in endless intergalactic space? We use religious language about being created in the "image of God," yet what is unique about being human? It certainly isn't our physical origins, as we know from Darwin; even our ability to reason, once heralded as the uniquely human trait, might soon be outmatched by computers. If the processes of evolution are in fact the ways God created us, should we take up those very processes through genetic engineering; or is life, even evolution, "sacred," not to be tampered with? Finally to what hope do we cling as we face the future, if ultimately the universe itself is destined either to freeze through infinite expansion or to end in a fireball of soaring temperatures as it recollapses into itself?

In our era many take for granted that science will provide a new more trustworthy basis for hope than religion. Science brings a grand vision of a universe of incredible beauty and complexity, of endlessly interconnected species of life on earth and the limitless horizons of space and the cosmic future. Yet if the empirical method is the only reliable route to truth, then even science can be the reason for an overwhelming sense of meaninglessness. With no evidence of the transcendent, many leading scientists find that nature on its own—from the carnage of the jungle to the blind whirring of subatomic particles—leaves few pegs to hang hope on. As Nobel laureate Steven Weinberg wrote in *The First Three Minutes*, "The more the universe seems comprehensible, the more it seems pointless."

My own life "passages" echo both the bitter and the sweet moods of one immersed in science and seeking to find meaning. I want to recount to you three stages in my life which have led me to my present struggle with the meaning of Christian discipleship and the challenge of physics: stages of formation, flux, and focus.

Three Phases

Formation

I was born in the summer of 1946 in the sleepy San Fernando Valley of Southern California, amidst the orchards and foothills of Los Angeles. My love of nature and my yearning for science go as far back as I can remember. By the time I was eight I had announced to my parents that I wanted to be a "theoretical physicist." Although they were confused about where I'd gotten such an idea, to me it was second nature. My whole generation was caught up in science and space. We read Ray Bradbury and dreamt dreams of the red planet Mars—and beyond. Evenings I'd watch the fading sunset with Jupiter, a silver diamond set in the mauve sky so close you could reach out and touch it. The nights were filled with stars, stars, stars ... and the dream that someday we'd go there. I remember waiting up far past bedtime for Andromeda to rise above the dark horizon, standing in the cold winter night to search for the Great Galaxy, suddenly finding it—serene, expansive, beyond reach yet intimately present. One hundred billion stars. Life everywhere, beckoning. Knowing we humans had only just begun our long voyage to galactic community.

Alongside my passion for space there flowed a

Robert John Russell was born and raised in Southern California. In 1968 he completed his undergraduate training at Stanford University with a major in physics and minors in music and religion. He then began concurrent studies in physics and theology, receiving an M.S. in physics from the University of California in Los Angeles in 1970, and an M.A. in theology from the Pacific School of Religion, Berkeley, in 1972. His Ph.D. in experimental solid state physics was received from the University of California, Santa Cruz, on the same day that he was ordained in the United Church of Christ (Congregational). He is Founder and Director of The Center for Theology and the Natural Sciences, and Associate Professor of Theology and Science in Residence at the Graduate Theological Union. Other recent activities include his work as co-editor of the book Physics, Philosophy and Theology: A Common Quest for Understanding *(Vatican Observatory Press, 1988), and Book Review Editor for* Zygon *from 1985-1988.*

religious sensibility whose well-springs stem from my earliest memories. I have always known myself as both a sojourner of the celestial heavens and a pilgrim of an invisible Heaven. Since my family roots are both Roman Catholic, on my dad's side, and Episcopalian, through my mom, a recurring issue became that of Christian identity. For me Sunday mornings were special. At church my spirit moved with its own momentum and destiny. I was baptized Roman Catholic, but since my dad, an Italian Catholic, never went to Mass—though he believed in God in his own way—my mom took me to a nearby Episcopalian church. I felt at home in the pews, with their padded kneeling benches and the otherworldly fragrance of incense and communion wine. Watching her take communion, I felt close to the veiled mystery of God become one of us and one for us in the wine and wafers.

By the time I was eight I had announced to my parents that I wanted to be a "theoretical physicist."

My question about Christian identity was always mingled with the ethnic one as well. My Catholic father was the firstborn of Italian immigrants, my Protestant mother, the youngest child in a family of Swedish immigrants. Family parties tended to be highly one or the other: lots of pasta, anchovies, Parmesan, and talk of Italy, or Swedish treats and skoals. Yet the two sides of my family rarely mixed, and I was left to search for my identity as a wayfarer between distant Nordic and Mediterranean cultures.

In these early years the themes of mediation and reconciliation began to take shape, although inarticulately and tacitly. I was beginning to learn something about sitting with each of my parents and relatives, experiencing their reality as my reality, seeing the essential rightness of their ways and perceptions, while yet moving to another person and living within their world and values, getting a feel for their integrity and authenticity. I was beginning to learn about *crossing over*, about finding ways to integrate contrasting perspectives, that life's meaning comes about through community and that community is based on reconciliation as well as covenant.

Soon, however, a new—and this time dark—theme burst open. Into the days of warm summers, cool evenings, star gazing with my new telescope, the joy of school and learning, my puppy dog, family and friends, came sudden death: overnight my dad died without even the chance for farewell. It was just three months after my twelfth birthday and nearing the Christmas season. In a moment my whole world changed. I was caught up in caskets and rain, being told that I was to be the man of the family, that I must now take care of my mother. Behind this, behind the morbid curiosity about death and the drowning feelings of grief and loss came an insistent, unsilenceable, rasping question propelled by a mounting anger: How could this happen? I knew how he died; he died of a sudden massive heart attack brought on by diabetes. But I wanted to know *why* he died, why there is death, how could it be this way, and most of all, would I ever see him again. So entered the second theme which was in so many ways to dominate and drive my life from then to this day: what is the meaning of our resurrection faith, what is it that we hope for after death, and how could God let it be this way?

I remember asking our minister if I'd see my dad in heaven. We were standing in my garage near my work bench where I was showing him the electronic kit I had just finished assembling. I felt close to the secret world of nature in that quiet garage, where science provided the only reliable guide in my upside-down life. But my minister looked at me with sad eyes and said about heaven, "We don't believe in that any more; science has changed all that." Today, so many years later, I understand what he probably meant—we've all read Bultmann, we all know that the New Testament is filled with the language of myth! But at a much deeper level I've never agreed with him, though by giving me that inane answer he probably did me a favor, planting a seed, a scream of "No!" in my soul which drives me to this day to work out a much more defensible answer, a much more resurrection-filled "Yes!"

I remember asking our minister if I'd see my dad in heaven ... My minister looked at me with sad eyes and said, "We don't believe in that any more; science has changed all that."

After that we moved around a lot. I remember those years of sadness and mourning. I threw myself into school work, music, and physics. In 1964 I left

high school behind and entered a new world, Stanford University.

Flux

Stanford was a time of discovery—and conflict. I arrived at Stanford with a great sense of expectation and anticipation. During those four years I studied physics day and night, yet found time to minor in music and religion. The location was unbeatable: I breathed in the moist breezes from the Pacific, climbed the surrounding hills crested with fog, drank in the almost mystical quality of Stanford's adobe brick and tile architecture, its themes of the early Spanish mission, and biked endlessly through the acres of surrounding woods. Yet when I entered Stanford I had no inkling of the intellectual challenge that was about to commence. I had graduated with the highest SAT scores in the history of my high school; yet at Stanford I barely passed the math qualifying test given to potential physics majors. Life suddenly became intensely competitive and the chances of reaching my career goal far less certain.

As my immersion in the world of science increased, the theology I was raised with seemed less and less adequate.

Still in those uncompromising years I reveled in the new understanding of nature which came with the laborious hours of study. The sheer beauty of nature compelled me relentlessly: how could nature be so subtle and yet so vulnerable to human understanding? Everywhere I felt a presence, a background hum, as I worked in the lab and at my desk, calculating, calculating.

Those were days of wonder. I remember:

- Hiking up to the radio telescope which looms above the campus with my best friends, explaining to them the amazing world of Einstein's relativity, realizing that they didn't have the foggiest inkling of what I was talking about.
- Running across the fields at 2 a.m. barefoot to feel the wet grass, feeling hopelessly stupid because I was unable to calculate the second derivative of the radius vector with respect to time in spherical coordinates, needing to run and run.
- Doing my best and still getting B's.
- Struggling with equations for hours to find a minus sign or a factor of 2. Not finding it. Feeling terribly slow and stupid.
- Taking five three-unit science classes while my friends take three five-unit humanities classes. Five problem sets every week. Five final exams.

As I deepened my education I found new worlds opening up, vast horizons of knowledge which beckoned me to follow.

Though the physics major demanded most of my time, I managed to find niches for courses in music, religion, history, and art. As I deepened my education I found new worlds opening up, vast horizons of knowledge which beckoned me to follow. I spent six exhilarating months studying music, art, and philosophy at Stanford's overseas campus in Florence, but with my last two years at Stanford increasing hours of physics shut out everything else from my studies.

Already a wedge was being driven, not only in sheer demand on my time, but in conceptual frameworks, between science and the humanities. As my immersion in the world of science increased, the theology I was raised with seemed less and less adequate. Prayer remained, and communion and student life at the Stanford Chapel. But what about my mind, being restructured by the structures of physics, chemistry, astronomy, geology, biology, computers. How was I to transform my faith so that it too could grow in knowledge and understanding of a God who creates all that is, a Redeemer of flesh and blood who lived among us, who knows our human condition and who was raised from the dead, and promises a real future in which some form of consummation and fulfillment will occur for all of creation groaning in this present age?

One way to resolve the dissonance would have been to compartmentalize science and religion by restricting science to facts and religion to values, science to nature and religion to God, and leaving it at that. I know that's the route most of my friends and teachers took for granted. But I was unwilling to believe that Christian theology—whether of Paul, Augustine or Aquinas, Luther or Calvin, Schleiermacher, Barth, Tillich, Rahner or any of the other great Christian thinkers—has nothing vital to say about the empirical world of the natural sciences—

the world in which, in at least one very profound way, we truly "live and move and have our being"! I couldn't let go of the nagging sense that there must be a deeper unity and this became a relentless, beckoning call to reconcile my two identities.

Focus

The best way ahead seemed to be graduate studies in both physics and religion. From 1968 to 1978 I studied in the seminary communities of Berkeley and the physics departments of the University of California. At the Pacific School of Religion I completed a Master's of Arts thesis in theology and the Bachelor of Divinity degree required for ordination. I also met and married Charlotte, who likewise completed her seminary work and headed into the parish ministry. At the same time I took a Master's of Science in physics at the University of California, Los Angeles, while doing campus ministry. During this time I found even more clearly than at Stanford that contemporary theology has, for the most part, ignored the sciences, following the tradition of bifurcation which traces back to the Enlightenment. The work that needed to be done had hardly begun.

Next we moved to Santa Cruz where I began doctoral research in physics. There amidst the beauty of nature's redwood groves near the pounding surf of the Pacific Ocean I worked two years in theoretical physics, studying gravitational theory and cosmology, and then I moved to experimental solid state physics, doing my thesis research in low temperature microwave spectroscopy.

I remember trying to sleep one night after an incredible day of discovery working alone in the lab, knowing I was the only person in the world who knew that secret.

As I moved more deeply into the community of research physics the joy of discovering nature's secrets grew ever stronger. I remember trying to sleep one night after an incredible day of discovery working alone in the lab, knowing I was the only person in the world who knew one of nature's secrets. I felt intimately tied to nature, like sharing a secret spoken in a whisper only you have heard, yet which soon you will tell to all the world and which will be confirmed in the work of others.

In those days of endless work the simple beauty of nature was ever before my eyes and I greeted her with religious awe:

- Watching liquid helium bubble in a dewar through a liquid nitrogen jacket. At 2.7 degrees above absolute zero, watching it suddenly go quantum and the bubbles stop.
- Heating a solution over a Bunsen burner, feeling its simple warmth and the peace of that moment.
- Watching the miraculous brilliance of the diamond ring effect just as the solar eclipse achieves totality.

I felt intimately tied to nature, like sharing a secret spoken in a whisper only you have heard, yet which soon you will tell to all the world and which will be confirmed in the work of others.

The elegance of theory brought an overpowering vision of the rationality of the universe, a mystery reflecting, for me, the constancy of our Creator God:

- Discovering the mathematics of indefinitely extended tubes of magnetic flux pervading spacetime, convoluted and twisting everywhere like a mass of spaghetti.
- Visualizing gravitation, the sublime, invisible, quilt of raw extension.
- Sensing the hypercube, each face folded into another leaving no faces exposed to the world, yet possessing volume, extension, structure in the world.
- Discovering that the boundary of the boundary is zero: Escher is unembedable: geometrodynamics necessitates conservation of stress-energy!
- Imagining spacetime as emerging macroscopically from gentle photon events, and elementary particles the result of infinite topological structure.

Finally graduation came in June, 1978. I was offered a teaching position in the physics department at Carleton College. Since I could also work through the campus ministry there, I was ordained to the

Christian ministry in the United Church of Christ Congregational—the same day I received my Ph.D.! So followed three rewarding years teaching courses in physics and courses in science and religion at Carleton and ministering to students who were struggling with their own college experiences.

I began to envision a broad-based, ecumenical, inter-disciplinary forum which would bring together people from all walks of life ... any and all who are concerned about faith in an age of science.

At Carleton I began to feel the first real stirrings of dawn in my mind as I crossed back and forth between the "two cultures" of physics and faith. I began to envision a broad-based, ecumenical, interdisciplinary forum which would bring together people from all walks of life—from the sciences, philosophy and theology, from the university, the seminary and the colleges, from the churches and synagogues, from technology and industry—in short, any and all who are concerned about faith in an age of science. The location had to include major universities and colleges, an inter-religious seminary community, corporations engaged in ground-breaking technology, a spirit of free enquiry and an appetite for new ideas. The place I picked was the San Francisco Bay Area. And so in the summer of 1981 I found myself coming home across the long Mid-Western plains.

The Center for Theology and the Natural Sciences

Our project began in 1981 with the organization of the Center for Theology and the Natural Sciences in Berkeley, California. We are affiliated with the Graduate Theological Union, an ecumenical seminary community and graduate school in religious studies. Our program includes doctoral and seminary courses, international research conferences and public programs in theology, science, technology, and the environment. As Associate Professor of Theology and Science in Residence at the GTU, I teach courses for seminary students preparing for the ministry, for clergy returning for continuing education, and for masters and doctoral students who will teach others in turn as future faculty in universities and seminaries. We sponsor the annual J.K. Russell Fellowship in Religion and Science which brings a distinguished senior scholar in science and religion to lecture and teach at the GTU.

We offer monthly public forums which deal with fundamental issues in religion and science and with ethical issues of technology, human need and the environment. We organize seminars and research conferences with international participants as well as faculty from the University of California, Berkeley and other Bay Area campuses. We work with a growing number of churches throughout the region, such as in Silicon Valley, where members come from the new computer and genetic engineering technologies and in Livermore, where the nuclear weapons issue is intensely debated.

Along with basic research and the teaching ministry, we have participated actively in conferences held in Copenhagen, Krakow, Rome, Larnaka, Chicago, New York, Detroit, Jacksonville Beach, and the Bay Area, and we are working with several denominations in setting up longer-term programs on religion and science in the church.

This I Believe

In turning now to some of the critical issues arising in our ongoing work, let me emphasize the scope of the problem at the very outset: I believe we stand at the brink of a new Reformation, one in which virtually all of our theology will be rethought in new terms. We must begin to make sense of our cherished traditions in terms of contemporary science if we are to enter a new period of theological discovery and vitality.

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As British biochemist and Anglican theologian Arthur Peacocke has urged, "Any affirmations about God's relation to the world, any doctrine of creation, if it is not to become vacuous and sterile, must be about the relation of God to, the creation by God of, the world which the natural sciences describe. It seems to me that this is not a situation where Christian, or indeed any, theology has any choice."

The importance of a theological engagement with science is underscored by process theologian John

Cobb, Jr., who writes: "In the modern world the greatest challenge to Christianity for the minds of Western people has been science and the modes of thinking which it has inspired. Insofar as the church in modern Europe has avoided being driven into a ghetto, this has been a result of its assimilation of, and transformations by, scientific wisdom. On the other hand, the church's resistance to appropriation of the universal truth offered by modern science has been a chief factor in the decline of conviction within its ranks and the weakening of its capacity to shape and guide modern thought."

What about faith? What is the role of faith in knowing?

Of course there are good reasons for such "resistance," for keeping science and religion separate. The methods of science, based on reason, facts, and objective testing, can seem utterly different from those of theology, based on revelation, private religious experience and subjective judgment. Yet I believe that theological doctrines can be taken as something like scientific theories, open to testing, to potential falsification and revision. I take them to have a provisional and hypothetical character much like a scientific theory, constantly subject to reformation. Perhaps the hardest question of all—what counts as theological data? I would include, along with religious experience, the covenants of religious communities, scripture, creeds, and the judgment of church councils. Yet in some less direct but irreducible way, the data of science, even more accurately the theories of science, have always been and should once again become data for theology.

What about faith? What is the role of faith in knowing? As Michael Polanyi has so carefully argued, science and theology, and indeed all systems of knowing, depend on presuppositions which transcend specific truth claims. Knowing depends on believing as well as on the object under analysis. Science is based on the faith that empirical facts are meaningful, the belief that the intelligibility of its procedures is related to the intelligibility of the world, the presupposition that the precision of its predictions and the explanatory power of its theories are evidence that through them it grasps the world with ever increasing clarity. Theology is based on a similar premise, that religious experience in all its forms is meaningful, that religious doctrines, through their moral codes and prophetic voice, are revelatory systems disclosing the world both as it is and as it ought to be in relation to its Creator/Redeemer God. In fact the historical origins of science lie in this very conviction of Western monotheism, that the intelligibility of the world reflects the rationality of its Creator, and that one must experiment with the world to find out what is true about it, since God freely creates the world and thus could have created a different one.

Theology is infused with metaphors about God's relation to the world, as Janet Soskice and Sallie McFague point out, metaphors which convey our religious experience, the "data for theology": God the potter, the Lord as my shepherd, the Spirit as giver of life. These metaphors are brought together into broader models, like the Nicene Creed or the double nature of Christ, and ultimately into fundamental theories or doctrines, like the doctrine of creation or the incarnation. Yet as Ian Barbour and Arthur Peacocke have argued, I believe one can best understand science, too, as structured in terms of core theories with their surrounding cadre of models and these in turn are brought up against empirical data. Hence even the structures of scientific theories can be taken as paralleled in theology. In both, testing is arduous, indirect, but the data count. Though the relative importance of subjectivity and objectivity differ in them, I believe that theology and science can be best understood in terms of their similarity than their difference. Indeed, as Nancey Murphy has repeatedly suggested, theological method within at least some theological perspectives, such as that of Wolfhart Pannenberg, could be significantly enriched by an explicit importation of the scientific method as understood by Imre Lakatos.

I believe that God is present in every moment and process throughout the universe, working in and with each element of nature's unfolding history with the exquisite craft of an artist and the caring hand of a parent.

Hence I believe we are ready, once again, for the facts and experiences of science and of religion to become mutually shared facts and experiences, and for the world-shaping paradigms to be cross-fertilized into stronger, more truthful visions of reality.

Given this program, let me try to say something about how I now see the situation in theology and

science with a focus on physics and cosmology. I should therefore start with my own central beliefs about God and open these to the discoveries and challenges of science.

I believe in a God who utterly transcends the world as its ultimate source and ground of being. I also believe that this God is present in every moment and process throughout the universe, working in and with each element of nature's unfolding history with the exquisite craft of an artist and the caring hand of a parent. God is unconditional love, experienced through friendships, parents, parenting, intimate love, and most deeply when love is most costly. I believe that in Jesus, God takes on the suffering of our world, even of the universe, without hesitation by entering into this struggle on the side of victims of injustice, disease, loneliness, war, poverty and despair. Christ bears our sorrows and, through a cruciform love, brings them ultimately to victory and joy by loving and embracing nature at every level, human and non-, by caring for every sparrow that falls, every blade of grass that thrives and withers, so that none be left out of the age of final fulfillment and the realm of divine peace. I believe in a God whose Spirit abides with us as counselor, comforter and teacher, who reveals the truth of all that we know and discover, who nourishes our soul with forgiveness, our minds with knowledge, our hearts with wisdom, our bodies with food, shelter and clothing, and who walks with us through the terror of death and dying into life everlasting.

The most stringent test of knowledge is the willingness to subject one's basic presuppositions and cherished beliefs to the radical and impartial test of evidence.

Yet I wrestle with the meaning of these core beliefs, testing their meaning in the whole range of human knowing. Theological doctrines, in this very important sense, are more like theoretical hypotheses than dogmatic utterances, a point often emphasized, for example, by Pannenberg. They are claims to knowledge, and like any other such claims, we must open them up to doubt. For the most stringent test of knowledge is the willingness to subject one's basic presuppositions and cherished beliefs to the radical and impartial test of evidence. Unless we are prepared to have our views falsified, we cannot finally claim that they grasp something deeply true about reality. In this claim lies the paradox of objectivity. On the one hand, the more our theories survive such testing the more we feel warranted to believe that they are true; yet we also know that they must eventually be disproven, since no theory yields a literal picture and complete explanation of the world, and hence we must be willing to renounce them in humility to the ineffable mystery of existence. And so in theology as in the natural sciences, I believe we are called to the discipline of constantly constructing, testing, and, if necessary, even abandoning our paradigms as we engage the mysterious and surprising character of the world.

Creation out of nothing stands for the absolute transcendence of God and the utter dependence of all creation on God as its source. Without God there would be nothing, neither form nor substance.

For me those tests of faith lie most immediately in the context of the natural sciences. Let me share a few of them with you, turning first to cosmology, the study of the origin and structure of the universe. It is here that I began initially to explore new ways of relating theology and science, since for me cosmology has always had a special attraction. Can we, even in science, conceive of the universe as a whole? Can there be a scientific theory about everything that is? How could such a theory be tested? Would such a theory be relevant to any of our biblical and theological claims about how the world came to be, or about God's continuing creative acts in the world?

In fact, one of the triumphs of physics in this century has been the construction of a scientific cosmology. Though fraught with problems in classical physics, a theory of the whole has become feasible—though debatable—in contemporary physics. It was the genius of Albert Einstein who first, in 1905, combined the concepts of space and time to produce the four-dimensional spacetime interpretation of nature. Within a decade he had extended this concept to include the effects of gravity by introducing the concept of spacetime curvature and placing curvature and matter into a dynamic "give and take" relation in which "matter tells space how to curve

and space tells matter how to move," as Charles Misner, Kip Thorne, and John Wheeler describe it.

Using Einstein's theory of relativity, cosmologists have produced two now-standard models of the universe. In both, the entire universe, all that is, starts off some fifteen billion years ago in "the Big Bang." Unlike the infinite, flat, and unchanging universe of Newton, we believe the universe itself is even now still expanding from that incredibly small state of infinite densities and temperatures at its beginning. Yet according to these models, the universe could have one of two very different far futures: one in which it will expand and cool forever, another in which it eventually re-contracts, returning again to infinite temperatures and vanishing size. If the universe has a finite future, it turns out that it also must have a finite size; such a model is called a closed universe. If it has an infinite future, it must also have an infinite size; this possibility is called an open universe. These astonishing scenarios raise profound questions about the origin, nature and destiny of the universe, questions which seem in many ways to relate to the biblical belief in God the Creator.

The world is in this double sense arbitrary: it need not be the way it is, for God was free to create it another way, and it need not be at all, for God creates out of freedom.

Now by the term "Creator" theologians bring together two distinct concepts: *creatio ex nihilo* or creation out of nothing, and *creatio continua* or continuous creation. Creation out of nothing stands for the absolute transcendence of God and the utter dependence of all creation on God as its source. Without God there would be nothing, neither form nor substance to use the classical phrases. Moreover the act of creating is a free act on God's part, unconditioned and unnecessary. Hence the world is in this double sense arbitrary: it need not be the way it is, for God was free to create it another way, and it need not be at all, for God creates out of freedom. Hence we can say that God creates, not only matter and life, but the very possibility of matter and life, and that God creates all that is in a single free and transcendent act which embraces all time and space. This is why, for example, Augustine argued, in the *Confessions*, that God creates time as well as all material things—God does not just create in time, but time itself has a beginning. Understood thus as *creatio ex nihilo*, all things owe their existence to God—not just at the beginning but everywhere in time. Moreover the very distinction between God and the world was often couched in language about the finite versus the infinite: God is eternal, everlasting, omnipresent, infinite, the world is temporal, transitory, finite.

Does the beginning of the universe as seen by science, the event at "t=0," correspond in any way to the doctrine of* creatio ex nihilo? *I think this is one of the leading questions on the agenda for theology and science today.

Yet according to the Big Bang, the entire universe has a finite history, beginning a definite and finite time ago—something on the order of fifteen billion years. Does the beginning of the universe as seen by science, the event at "t=0," correspond in any way to the doctrine of *creatio ex nihilo*? I think this is one of the leading questions on the agenda for theology and science today. It is the subject of intense debate ranging from those who closely identify with the two concepts of creation, as in recent articles by Ted Peters, to those who wish to keep science and religion strictly segregated, as reflected in the widely held "two languages" or "two worlds" approach.

I am working to construct a middle position in which the doctrine of *creatio ex nihilo* could be related to, and in a definite sense, tested by, scientific cosmology, through a detailed process of unfolding the meaning of *ex nihilo* through a series of models until these models gain direct correspondence with science. I take *creatio ex nihilo* as containing, as its core insight, the concept of absolute dependence, a concept which entails the radical contingency of all creation. Now one fruitful model of contingency is finitude and finitude in turn can be interpreted in terms of time and space, as well as through other categories. Hence *ex nihilo* can be taken to entail, though it cannot be exhaustively reduced to, the belief (or prediction!) that a fundamental characteristic of the universe must be temporal finitude.

Traditionally this was taken in a historiographic

sense, that the universe had a beginning in time, that time itself began or was created along with the universe, as I already mentioned. Clearly in this way the universe as depicted by scientific cosmology is "consonant with" (to use the germinal phrase of Ernan McMullin) the theological meaning of finitude and in turn the broader theological claims about contingency and dependence, and a temporally finite world is sharply differentiable from an eternal Creator.

"What if there were no God? Would there be anything at all? Isn't even empty space something? Could there truly be absolutely nothing?"

Yet according to cosmology, the universe may be either temporally limited or unlimited in terms of the future, depending on whether it is closed or open, and its size may be infinite—both of which seem inconsistent with the doctrine of creation and the meaning of the distinction between God and creation. Moreover, what would we say to the even more complicated claim that the universe, if open, is in fact both finite and infinite—having a finite past and an infinite future and size? Would this resonate with or be in dissonance to the theological meaning of creation out of nothing, or our traditional conceptual framework in which we thought of God as infinite and the world as finite? If the universe is destined to last forever and if its size is infinite, how do we distinguish it from God as its source? Moreover, recent inflationary theories of the universe, and the widely-debated "universe without edges" which Steven Hawking describes in his *Brief History of Time*, take the discussion to another level of complexity. Though space won't permit us to continue here, a number of us are very actively working on a detailed philosophical and theological appraisal of these issues.

Let us leave this problem for now, for this is a cutting edge issue which is simply not settled so far. Another mode of relating cosmology to theology is to return to the basic paradox of existence, why there is anything at all. Though science explores the causal chains which take us from the present to the possible beginning of the universe, we still ask why there is in fact any universe as such. I remember as a child drifting in that dream-like state just before sleep on many a warm summer's night, remembering the stars and my telescope, and then asking, "What if there were no God? Would there be anything at all? Isn't even empty space something? Could there truly be absolutely nothing?"

Now we are discovering that, even at the boundaries and limits of scientific explanation, there remains this fundamental question, posed at a meta-level to science, the question of existence as such. We know our current understanding of the universe will change—and is already doing so with the new inflationary theories and eleven-dimensional models of the universe—and yet even if through a new theory we push the clock back somehow to before the Big Bang, that theory too must eventually run into a limiting question preset by the very method of scientific inquiry. For science explains one contingent state of affairs in terms of another equally contingent one; every answer leads to a new question and the ladders of science are infinitely long backwards and forwards in time, upwards to the universe and downwards to the subatomic realms and beyond.

Granted, the currently popular "theories of everything" challenge this view, for suppose there does exist a unique, fully self-consistent and entirely correct theory of everything, and further suppose that we could find it using only a finite number of data points. Then science would be at an end! Is this possible? And would it mean that the existence as such of the universe would necessarily be entailed by such a theory, or only that if a universe exists it would have to exist in this way?

Every answer leads to a new question and the ladders of science are infinitely long backwards and forwards in time.

To me this approach tends *a priori* to raise more questions than answers. I would argue that no theory could be fully self-evident, self-sufficient, and necessary, and at the same time be scientific; i.e., empirical, testable, and hence contingent. It is here, to this level of question about the contingent existence per se of the universe, that I believe Western monotheism has a great deal to contribute. It is here that I find the meaning of the transcendence of God as Creator and the essential distinction between God and creation to be precisely on target. For most of Western theism holds unswervingly that God as the transcendent Creator is the

unique self-sufficient and necessary source of all that is, the ground of being who creates the universe, to use the Big Bang model for a concrete example, both at its beginning and at every moment from there on until its future—be it finite or infinite. It is God who, in the time-honored phrase, is "Maker of Heaven and Earth," that is, of all that is.

We must look, probe, press, touch and measure this world to discover its real character.

The theological commitment thus seems to be grounded on the contingency of the universe, a contingency finally beyond the ability of any scientific theory (i.e., contingent epistemology) to dissolve. If that be true, and it is certainly the argument recently restated with conviction by as distinguished a philosopher as Norris Clarke, then only philosophical theology can give a truly coherent explanation to the most general and most existential questions raised by science or any other epistemology.

Christian faith also holds that God is the ground for the intelligibility of nature through the divine logos, the mode of God's creating in which all things were and are being created by the Word of God. This means to me that the intelligibility of the universe, and hence the ability of science both to explain and to predict, is grounded in the intelligibility of God as present and expressed in that divine Word in all creation. Moreover, the freedom of God to create at all, and to create the universe which is actual, means that the universe need not be the way it is, and that by reasoning alone we cannot discover its facts and laws. Instead we must look, probe, press, touch and measure this world to discover its real character. And so modern science as an empirical method, in contrast to the Aristotelian ideal of deduction, is grounded in the doctrine of creation: that God freely creates all that is.

The doctrine of creation also entails the concept of continuous creation. God is present as immanent Creator acting in each moment, where novelty and surprise, chance and change, are the keys. Not only is God the transcendent source of all that is, in this sense answering the question why there is anything at all, but God is immanent to every process, particle, and event in nature. As St. Paul wrote, "we live and move and have our being in God."

What can we mean, though, by God's continuous, active presence in light of contemporary science? Here again I find science raising some thorny issues. Following the Enlightenment and the rise of modern science, the deterministic framework of Newtonian mechanics seemed to many to exclude God from active and constant interaction with the world. It seemed that God could only intervene, filling the gaps in science's account of nature. But these gaps closed as science advanced until nothing was left for God to do except, possibly, get the whole thing started, and an interventionist God was in effect a God who was usually absent—hardly the God of covenant and grace.

It seemed that God could only intervene, filling the gaps in science's account of nature. But these gaps closed as science advanced until nothing was left for God to do except, possibly, get the whole thing started.

Today, however, we are in a new era of rapproachment between science and religion. The deterministic world view of Newton has in many quarters been thoroughly eroded by science itself. Yet what has replaced it? According to many, the overwhelming message of science is that constant change and blind chance dominate nature rather than mechanical causality, fixity, plan and purpose. To mention just three areas: Quantum physics, the study of nature at the atomic level, depicts nature as dominated by chance. According to the famous Heisenberg uncertainty principle, the classical meaning of mechanical causality should be replaced by at most a statistical causality at the level of microscopic processes. In Darwin's theory of biological evolution, species evolve through the principles of variation and selection, and nature's structures arise out of endless, "blind" chance events. Today we know that at the molecular level genes provide the mechanism of variation and, in combination with environment factors, genetic variation drives the entire evolutionary process. Finally thermodynamics, too, underscores the fundamental role of chance in nature, where all systems are governed by the second law of increasing entropy and hence increasing disorder. Recent work in chaos even suggests that classical physics was less deterministic than we thought.

And so contemporary science, by emphasizing blind chance over mechanical determinism, both opens the doors for the presence and activity of God as immanent in a universe without strict mechanical determinism at every level, and at the same time challenges our belief that such an immanent God can act with any sense of purpose and plan within the random processes of the world. Will contemporary science overturn our hope that all things are somehow moving forward to a final, eschatological fulfillment, a fulfillment that gives life meaning in the face of death? When the universe was thought of as a causal system, as classical physics argued, there seemed to be no place for God to act; now if it is an open system with chance in charge, as quantum physics, thermodynamics and biological evolution portray it, there seems to be no room for God to act with purpose—even if God is somehow acting in the "background noise" of random, chance events.

How then is theology to reconceive the fundamental problem of God's meaningful action, redemption and eschatological fulfillment of the world in light of science? Here I can only mention some of the research proposals now being explored in depth by several of us. It is my hope that each can provide one piece of a larger emerging picture in which God can be seen to be at work in the universe. Each proposal is aimed precisely at meeting the challenge of science within the territory staked out by science—not by trying to protect theology by separating its domain as "the world God so loved."

Will contemporary science overturn our hope that all things are somehow moving forward to a final, eschatological fulfillment, a fulfillment that gives life meaning in the face of death?

At one end of the scale, arguments for the action of God can be framed in terms of quantum physics. Because of the Heisenberg uncertainty principle, the world appears to be open-ended; indeed without quantum indeterminacy it would be hard to understand how there is any room for real chance in the world at all. Of course chance appears at higher levels of organization—in the psychological, neurophysiological, biological, cellular, and molecular levels. Yet without chance playing an ontological role at the quantum level one could not be certain that such higher level indeterminancies were not merely a sign of human ignorance of the underlying microscopic factors governing these processes. If quantum physics guarantees that indeterminancy at the quantum level is irreducible, that, as many argue, nature contains no "hidden variables" in the classical sense at least, then nature at the most fundamental level must be inherently open-ended.

We now find chance to be part of the instrumentarium of divine creativity, and moreover, we now understand that chance is precisely what is required for the divine creation of self-conscious creatures with genuine free will.

Quantum physics thus contributes a necessary—though not a sufficient—piece to the explanatory puzzle of how God acts in the world by helping us understand the world as inherently open-ended. If the world is grounded ultimately in the being and reality of God, then God's action in the world involves a continuous creative presence within each event, co-determining the outcome not only of human choice but even of elementary physical processes.

As Arthur Peacocke has so powerfully suggested, quantum physics discloses one mode in which law and chance work together: precisely defined probability distributions (given by quantum laws) govern fully random events (quantum chance). By analogy we too operate between the poles of law and chance, for all of our actions are consistent with the laws of nature, yet we often experience them as free choices. By an extension of the analogy we gain insight into how God can act through the interplay of law and chance, such that all the unfolding of history is at once the law-like evolution of a natural system and the unique and irreversible sequence of free decisions grounded on divine initiative. Hence against those like Jacques Monod who believe that chance disproves theism, we now find chance to be part of the instrumentarium of divine creativity, and moreover, we now understand that chance is precisely what is required for the divine creation of self-conscious creatures with genuine free will.

Quantum physics offers a number of other, related

insights towards a new philosophy of nature and, in turn, grist for the theological mill. Recently I have begun to explore these further insights. For example, quantum chance is strikingly different from classical chance, where events we call random are really the result of underlying but undetected causal processes. With quantum chance, as I said above, we now believe there are no such underlying classical, causal paths. But there is more to quantum chance than this: there are in fact two very different kinds of quantum chance in nature. One kind governs the particles which produce the form and structure of matter (the so-called fermions of half-integral spin) while another helps fuse matter together by governing the particles which transmit the fundamental interactions in nature (bosons with integral spin). Hence the challenge will be to introduce not only quantum chance into the philosophical and theological arena along with classical chance, but the difference between kinds of quantum chance.

Somehow we must begin to think about creation theology in terms that reflect this more subtle interweaving of form and dynamics, of chance and order, of structure as embodied chaos.

Another insight comes from the complex relation between form and statistics in quantum physics. Classically we think of chance as disturbing a given structure: factors beyond our control introduce noise into the signal or scatter the data around the "correct" value. However, in quantum physics, chance plays a constitutive role in the formation of form and the dynamics of elementary interactions. Unlike the situation in much of classical physics, in quantum physics the statistical distributions of matter are all there is: they form the structures of nature. For example, the electron cloud, that "fuzzy" distribution of electrons surrounding the nucleus, is what gives rise to the structure, form and volume of the atom, and the statistics that characterize electrons (as represented by the Pauli exclusion principle) give rise to the impenetrability of the atom as well as its chemical valency; i.e., its power to combine in precise ways with other atoms to form chemical compounds. Somehow we must begin to think about creation theology in terms that reflect this more subtle interweaving of form and dynamics, of chance and order, of structure as embodied chaos.

One last insight, for now, comes from the problem of distant correlations of once-integrated quantum systems. Through the growing discussion of Bell's theorem we are facing an increasing choice between abandoning any but a predictivist interpretation of quantum theory or developing a new metaphysical system adequate and applicable to quantum physics. We seem to be moving progressively towards reconceptualizing the physical world through new metaphors of holism and global unity; nature from the quantum perspective is like a finely connected gossamer. These new metaphysical images promise vastly to reshape our concept of the immanence of God and the ways in which the divine intentionality is expressed in the world.

At the other end of the scientific scale, cosmology too offers an unexpected suggestion to theologians about the meaning of divine creation. According to recent arguments, we now believe that the character of our universe is highly dependent on the precise values of its natural constants, like the speed of light and the mass and charge of the electron. Extremely slight changes in these values would have resulted in an entirely different universe, one in which life would never have evolved at all. Captured by the phrase, "the Anthropic Principle," this argument suggests that the existence of our particular universe is intimately connected with the possibility of life. It could even be that our universe was, in some very specific sense, designed for life, designed to be one in which life would eventually evolve by the random processes of biological evolution.

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Hence the Anthropic Principle combines a form of classical teleology, that there is a design to nature, with the challenge of a thoroughly statistical scenario for all actual processes in nature. Though this should *not* be taken in any way as constituting a new "proof" for the existence of God, nor does it imply that the only way God acts is by creating the universe with the right initial conditions, it does help theologians speak empirically about the dependence of all that is on a transcendent Creator,

and about the cosmological significance of life in our universe. From an anthropic viewpoint, life is a global characteristic of this particular universe, leading after so many centuries to a new perspective in which biological existence may again be seen as central to the meaning of the universe. From this perspective all the forms of creation—physical, chemical, biological, psychological, and spiritual—evolve equally and directly through the divine choosing. Of course the Anthropic Principle need *not* be taken in any sense as a design argument, and perhaps it should not be. But it would still suggest that God is radically transcendent to creation, since it underscores the interrelated contingency of the characteristics of this universe (its existence per se and its compatibility with the requirements for the evolution of life), and hence its dependence in an ontological sense on God as necessary being.

What kind of future could one hope for—personally or cosmically—if the relentless increase of entropy meant that all things must decay and come to equilibrium?

Yet natural processes are characterized not only by chance and law; there is competition between forces producing order and others leading to disorder, cycles of growth and cycles of decay, times of construction and periods of dissipation, mingled in a profound and intimate way. Our theological perspective must be informed by these insights as well. When we work with a theology of redemption, entailing as it does the problem of good and evil, the relation of sin and death and the culpability of human free will within the mystery of divine grace and forgiveness, the agony of nature must become a central reality warranting sober theological interpretation.

How then should we understand the role of suffering and sacrifice in the process of healing and salvation? In the nineteenth century, thermodynamics portrayed a world of inevitable dissipation and decay. What kind of future could one hope for—personally or cosmically—if the relentless increase of entropy meant that all things must decay and come to equilibrium? Now, however, through the discoveries of Ilya Prigogine and others involved in non-linear, non-equilibrium thermodynamics and chaos theory, we are now learning that it is the very increase in entropy in complex biological and chemical systems that brings order out of chaos, providing the drive behind evolution and its production of ever more complex organisms. The production of entropy seems to be a factor in both disordering and ordering the world, and from a theological perspective this suggests to me that even in nature, suffering can be a part of redemption when God acts through the sorrows and brokenness of the world to bring hope and victory.

Again the life sciences have taught us that all life on earth, including homo sapiens, has arisen from simpler forms through a process involving suffering and death, that nature is "red in tooth and claw." We must now ask whether our commitment to a God who enters into human life in all its dimensions ought not be seen as entering into all that human life entails, including its evolutionary past, its environmental present, and its open-ended future. If God could become human for us and die on a cross, can that same God embrace the whole four-billion-year sweep of evolution? Somehow we must begin to talk about the immanence of God in all of nature's processes. If suffering love is the key to redemption, as Scripture claims, we must begin to listen to the suffering of our planet and learn from all that has gone into making us what we are, if our interpretation of redemption is to be faithful to the redemption activity of a God concerned not just with human history but with all creation.

If God could become human for us and die on a cross, can that same God embrace the whole four-billion-year sweep of evolution?

Finally, what about the future? As physicist Frank Tipler has repeatedly stressed, from the perspective of cosmology, the single most important fact we face is that the universe will continue for an almost inconceivably long time. The future of the universe is immense. Moreover, all that now exists will continue to undergo violent change. Life has taken four billion years to evolve on earth and yet in just ten thousand years humankind has produced all of its civilizations, cultures, and histories. What does it mean to think in terms, not of decades or even centuries into the future, but in vast multiples of all known history? The solar system should last for another five billion years, and beyond it the universe will probably exist for at least one hundred billion

years—if not forever. And so we face the profound challenge of the far future of the universe: what cosmic role will life spawned on this tiny planet have over the countless billions of years ahead? The Bible portrays a future of supreme fulfillment for humankind—though the path ahead includes an Armageddon of strife and pain. How are we to think and rethink the biblical drama in contemporary cosmic proportions?

I am convinced that together theology and science can more profoundly and more precisely address the mystery of existence—personal and historical, terrestrial and cosmological—than either theology or science can in "splendid isolation."

Somehow I believe we must start by conceiving human nature as intimately connected to the universe as a whole. We must let the reality of this universe which science has revealed reshape to the core our understanding of our destiny and our responsibility to a universal future. According to some remarkable work by Freeman Dyson, the perspective science brings is one not only of a vast, even infinite universe in size, but one in which life, if it is careful and clever, can continue for countless billions of years into the far future. If the speculations of Freeman Dyson, Frank Tipler and other cosmologists are at all correct, we are quite literally at the infancy of the universe and of life within it. If we do explore space and colonize the stars, as some envision, our role may indeed become that of the voice, the mind, even the spirit, of the universe. In the New Testament, Jesus promises to be with us "to the close of the age" (Matthew 28:20). In a cosmological perspective, this promise takes on an astounding character, and our calling is to unlimited discovery and unimaginable adventure.

Hence I believe that contemporary cosmology challenges us to vastly expand our own horizons, to evaluate our place in a cosmic setting, and to dream a dream beyond the earlier confines of our terrestrial backyard. I too believe that, no matter how inconceivably vast or how astonishingly new our discoveries of the universe will be, all is dependent upon the primordial ground of being, a creature of a transcendent source whose ultimate purposes are both everywhere manifest and yet hidden beyond the horizon of existence. As we embrace our role in the universe, we know that this source is also on our side, for God has become one of us, taking up within the divine the quarks and atoms, the dust of stars, and the flesh and blood of evolution, the struggle for consciousness and the paradox of human selfhood. From this perspective we can even more emphatically declare that we "live and move and have our being" within this divine mystery of our Creator and Redeemer. In this framework at least, I am convinced that together theology and science can more profoundly and more precisely address the mystery of existence—personal and historical, terrestrial and cosmological—than either theology or science can in "splendid isolation."

Toward a New Community

Science has brought both greater knowledge and more staggering moral and spiritual challenges to our age than any other system of thought in human history. We are only just now beginning a long road ahead, seeking to re-formulate religious faith with intellectual integrity in this world of science, and addressing the promises and conflicts of technology, human need, fragile global ecology, and nonrenewable finite resources. Will the future bring a new coherence of religious beliefs and scientific knowledge, or are we at the end of an era of religion stretching back over four millennia?

I understand out of my own life's experiences why so many today think our religions are drying up like desert rivers.

I recall my childhood, when I began to learn about reconciliation of views and, more deeply, of people. I remember the exuberance of science, the joy of discovering nature and myself as a part of nature, the delight of warm Sundays spent in church and at home. I also remember the searing flame of death's sting, the growing doubt cast by my increasing education in science, and the response of so much of our culture in its rejection of religion and its universalization of science. I understand out of my own life's experiences why so many today think our religions are drying up like desert rivers. I am tempted to believe this too, for it would be a relief to embrace nihilism with the stoic indifference one gains from accepting an inevitable conclusion.

Yet I keep believing that we will make it across the scorched badlands, discovering new springs of life-giving water to feed our religious streams. I believe that, like the early pioneers, we will make it across the desert, climb the challenging Rockies, and see the desert streams flow into the Golden Bay and the thundering Pacific Ocean beyond. And I believe the pioneers of this coming age will produce a new community who will do "theology and science" by incorporating the truth of each into a broader integration, a new paradigm.

And so we have a stream to follow to a vast ocean, there to build a bridge across it—a bridge which will bear traffic and reunite scientists and theologians from separated communities of different languages and customs but of common humanity. Our San Francisco Bay is crowned by a magnificent bridge which unites San Francisco with its neighbors to the north. It was built, not from one side over to the other, but by starting from both sides and meeting in the middle. And so, like the Golden Gate Bridge, we must start from both the scientific and the religious communities. Each must find bedrock in its own world, yet each must soar forward into the blue sky, with girders, cables, rivets, and most of all, with people who will climb out there, hanging in space above a cold churning ocean, and, while pointing out across the gulf that still separates them, add another piece to the invisible arch, hoping that in the fullness of time the two structures will meet at the keystone.

It is clearly a project that will take decades. But I believe the day will come in the not too distant future when, seen from a distance, a "critical displacement" will be reached and the structure will change in appearance from two ungainly, ragged outcroppings on distant shores to two arms reaching for each other, almost touching, defining a perfect curve through the blue sky. ✤

Science and religion attract one another, and this very attraction breeds the bolts they exchange. To switch metaphors, science and religion jostle for position on a common ground. Far from separate, they are linked in an inevitable tension that will never be resolved.

However, understanding lies in that tension. The hold that science and religion have exercised on the human mind over the centuries demonstrates that both offer profound insights into the mystery of what is. The religious community can learn by allowing scientific thinking to penetrate its world view.... The scientific community can let some fresh air into rooms stale with rationalism and cluttered with inert facts.

—David M. Byers, *America*, January 14, 1984

Presuppositions of Science as Related to Origins

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The author begins with quotations from Hans Krebs: "hypotheses must not move very far from the facts" and "evolution is based upon acceptance by faith of fundamental presuppositions"; then proceeds to examine the validity of the presupposition "that everything can be explained in terms of natural processes." He argues that this latter mechanistic presupposition is clearly inadequate in the light of our present biochemical knowledge. The complexity at the molecular level of even the simplest life forms leads the author to propose: "An intelligent cause was involved in cosmological and biological origins; nearly everything else may be explained in terms of natural processes."

In this paper, I will consider some underlying principles important for scientific research and some of the presuppositions that undergird our scientific endeavor. In June 1988, I attended an interdisciplinary conference in Tacoma, Washington, entitled "Information Content of DNA," which dealt with many of the topics that I am concerned with in this paper. I will discuss subsequently some of the contributions of these individuals to my current thinking. I will also refer to other prominent scientists whose research and writings have helped to mold my views. One of the latter is Dr. Roger Williams of The University of Texas who made the following comment in a lecture; he thought it may have come originally from one of the Wright brothers:

> If everyone accepted as true what is generally believed to be true, there would be no room for advances.

I believe this statement is one that every scientist should consider seriously. A scientist should always have a questioning attitude! I will come back to this thought repeatedly in the course of this paper.

I also have several quotations from Dr. Hans Krebs, a Nobel prize recipient. Dr. Krebs is certainly one of the most outstanding biochemists, with a research career extending from the 1930s to the 1980s. He spent about a month on our campus in the 1960s, and I had the opportunity to interact with him and listen to his lectures. Hans Krebs, in a lecture which was mostly philosophical in nature, made the following statements:

> Specific axioms are needed as guides to hypotheses, which in turn serve as a stimulus for experimental verification.[1]

This of course, is generally recognized. Krebs went on to say, however:

> Hypotheses must not move very far from the facts.[1]

The history of biochemistry, particularly in regard to metabolic pathways, is littered with proposals that were later shown to be incorrect, primarily because the hypotheses proceeded too far beyond the facts. If you build hypotheses upon hypotheses, you will nearly always be wrong, and the result will be worth little or nothing. Scientific research must always be solidly anchored with experimental verification of initial hypotheses. It seems to me that this

This paper is a revised version of The Mary Huling Edens Lecture presented by the author at The University of Texas Medical Branch at Galveston in February, 1989; also of a presentation at the ASA Annual Meeting at Indiana Wesleyan University, Marion, Indiana in August 1989.

principle has often been forgotten in the pressures to obtain research funding. When a set of basic experiments is proposed in a grant application, the applicant is expected to go on to propose a second set of experiments and then a third set of experiments without knowing the results of the first experiments. This type of pressure is always a danger in our present system of grant supported research. The applicant is forced to proceed from valid hypotheses to hypotheses that are very tenuous.

Let's consider another statement by Dr. Krebs which relates to evolution:

> Although supported by a body of evidence, it cannot be rigidly proved or disproved; it is based upon acceptance by faith of fundamental presuppositions.[1]

Let us examine now some of the basic presuppositions of science, and see whether we agree with them, or whether they need to be challenged. The following resolution comes from the National Academy of Science:

> Religion and science are separate and mutually exclusive realms of human thought whose presentation in the same context leads to misunderstanding of both scientific theory and religious beliefs.[2]

In general I would agree with this statement, and certainly in practice I would agree with it. However, when you deal with presuppositions, you cannot really separate religion and science, nor can you separate philosophy and science. All of these are intertwined in some manner or another when we consider the basic presuppositions of science.

Let me now examine some of the basic presuppositions as expressed by others. These are some that are cited by Dr. Charles Hummel in his book *The Galileo Connection*.[3]

1. "There is order in nature. Nature has an underlying order that can be discovered." This is so fundamental that if it were not valid, most of us would not be doing research.

2. "There is uniformity in nature. What happens in one laboratory can be repeated elsewhere." This last portion may need to be qualified somewhat by adding "under the same conditions." Achieving the same conditions is what causes lots of problems for scientists. If someone else cannot repeat our work, we hope we can attribute it to not having the same conditions. Uniformity has also been used in geology; not that events are happening necessarily with the same intensity, but that the same types of events have been happening throughout the various geological ages, whether they be catastrophic in nature or not.

3. "Validity of sense perception, or of sense extenders." We have all sorts of instruments whereby we may extend our various senses, whether they be microscopes to extend the capacity that we have to see, or whether they be other instruments utilized to detect various other phenomena.

These are three of the major presuppositions of science, and I believe they would be accepted by nearly all scientists. If we start pressing them too far, we might find some problems. For example, with the validity of sense perception, there is always the problem of artifacts. Simply because data comes out of a machine does not necessarily mean that it is correct. We have to constantly be alert for the possibility of artifacts by carrying out appropriate control studies. Nevertheless, the presupposition regarding the validity of sense perception would be generally accepted by most of us.

The following is one basic presupposition where one might challenge a portion of the statement: "That everything (including origins) can be explained in terms of natural processes."[4] The part that bothers me is that the word "everything" per-

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mits no exceptions. If it were "nearly everything," I would not object.

Jacque Monod, in his book *Chance and Necessity*, expresses the same thought in somewhat more flowery language: " ... that chance alone is at the source of every innovation, of all creation in the biosphere. Pure chance, absolutely free but blind, is at the very root of the stupendous edifice of evolution."[5]

When you deal with presuppositions, you cannot really separate religion and science, nor can you separate philosophy and science. All of these are intertwined in some manner or another when we consider the basic presuppositions of science.

George Gaylord Simpson, in *The Meaning of Evolution*, says: "Man was certainly not the goal of evolution, which evidently had no goal. He was not planned, in an operation wholly planless."[6]

Henry Margenau, Professor of Physics and Natural Philosophy at Yale University, makes the following comment: "Darwin's theory of evolution relies heavily on chance, unmitigated chance."[7]

In regard to the role of chance events, Margenau notes: "There are ... important differences between the role of probability in quantum mechanics and in Darwinism. One difference is that quantum mechanical probabilities can be computed in an *a priori* manner, and their values have been verified through innumerable measurements. This is not true in the theory of evolution, where the probabilities involved are related to certain conjectured chemical processes ..."[8]

Margenau, in his book, *The Miracle of Existence*, provides an excellent critique of the views of origins that may be referred to as materialistic or mechanistic, i.e., that everything may be explained in terms of natural processes.[9] The emphasis in the rest of my paper will relate to challenging that word "everything" in the above presupposition. Can we qualify that word, or at least modify it? I believe we can.

Let me come back now to the word "evolution" that has been used in my previous quotations. I like to be somewhat more precise in defining the word "evolution." I believe there is a great need for properly defining the terms that we use. Basically, there are three different types of evolution.

1. *Chemical evolution*, which refers to the origin of life; the origin of living cells from nonliving matter. It is really quite distinct. Charles Darwin, in his *On The Origin of Species*, had nothing to say about chemical evolution.

2. *Microevolution*, which is the divergence of species. This is really the primary contribution of Darwin's research; the tremendous divergence and development of new species. He provided a considerable body of evidence for this type of evolution.

3. *Macroevolution*, a term which is generally applied to the development of new phyla, or possibly to new orders or classes. Sometimes, the term macroevolution has been used in regard to the development of the eye, or the development of hearing, etc.

There is no sharp dividing line between macroevolution and microevolution. Since we have these three distinct types of evolution: chemical evolution, microevolution, and macroevolution, I will try to be precise in my terminology when I deal with these types.

"Pure chance, absolutely free but blind, is at the very root of the stupendous edifice of evolution."

G.A. Kerkut, in his book *Implications of Evolution*, includes the following assumptions as involved in theories of evolution:

> 1. Non-living things gave rise to living material, i.e., spontaneous generation occurred. 2. Spontaneous generation occurred only once. 3. Viruses, bacteria, plants and animals are all interrelated. 4. The protozoa gave rise to the metazoa. 5. The various invertebrate phyla are interrelated. 6. The invertebrates gave rise to the vertebrates. 7. Within the vertebrates the fish gave rise to the amphibia, the amphibia to the reptiles, and the reptiles to the birds and mammals.[10]

Kerkut evaluates each of these assumptions critically, noting arguments both for and against each of them. He also indicates certain alternate assumptions for some of these that may be equally plausible.

Kerkut then notes: " ... that these seven assumptions by their very nature are not capable of experimental verification."[10]

Our understanding of the complexities of cellular processes has increased by orders of magnitude, not just by doubling or tripling.

The first assumption of Kerkut would correspond to chemical evolution. The second assumption, which is sometimes referred to as a monophyletic origin (as opposed to polyphyletic origins), is related more to universal similarities of organisms. More recently, many have suggested that the universality of the genetic code makes more sense if life originated only once. It should be noted that if this second assumption is correct, chemical evolution would not qualify for scientific study since repeatability is an essential prerequisite for experimental studies. Without a more specific indication of the evolutionary change involved, it will suffice at this point to note that both macroevolutionary and microevolutionary changes would be included in assumptions three through seven. These seven basic assumptions are related very closely to the one presupposition previously mentioned; i.e., that everything can be explained on the basis of natural processes.

There have been several books published in recent years that relate to the topic of chemical evolution. *The Mystery of Life's Origins* by Charles Thaxton, Walter Bradley and Roger Olsen, and *Origins: A Skeptic's View* by Robert Shapiro, both carefully evaluate the experimental evidence for chemical evolution. The authors of both books agree that experimental studies thus far provide no real evidence in support of chemical evolution. The third book is one written by Michael Denton of Australia, *Evolution: A Theory in Crisis*. Denton is a molecular biologist, but one who has a very broad understanding of all areas of biology. In regard to chemical evolution, Dr. Denton asks this question:

> Is it really credible that random processes would have constructed a reality, the smallest element of which—a functional protein or gene—is complex beyond our own creative capacities, a reality which is the very antithesis of chance, which excels in every sense anything produced by the intelligence of man?[11]

I don't believe we should have any argument regarding the validity of this statement. The intelligence of man, in the forty years that I have been involved in scientific research, has advanced our understanding of science tremendously, particularly in regard to molecular biology. This is very evident when I compare the concepts current when I was in graduate school forty years ago with those of today. For example, the knowledge that a specific protein has a specific sequence of amino acids in a linear chain was unknown then. We considered then that the plasma protein, albumin, might be a group of closely related molecules with similar properties; but the idea that a particular protein might have a specific amino acid sequence was unknown at that time. Our understanding of the complexities of cellular processes has increased by orders of magnitude, not just by doubling or tripling. This illustrates the type of scientific advance that led Michael Denton to make the statement I quoted above.

"Hypotheses must not move very far from the facts."

Let me come back briefly to the issues of chemical evolution. For a number of years, school textbooks have included the experiments of Miller and Urey involving the production of amino acids from so-called primordial gases in a sparking chamber. This was hailed by many as a real breakthrough in chemical evolution studies. Both of the books noted above (Shapiro, and Thaxton, et al) have pointed out that the major presupposition for this experiment was that a reducing atmosphere surrounded the earth at the time that life began. Yet they also note that most scientists today doubt that a reducing atmosphere ever surrounded the earth. This, of course, means that all of the experiments utilizing a reducing atmosphere have no significance to origin of life studies. All workers in this field agree that if there were no reducing atmosphere, those experiments make no sense as origin of life experiments. But even if these experiments did make sense, the amino acids produced were a mixture of D- and L-amino acids, and many of the amino acids formed are not found in protein molecules. I must note again the quotation cited earlier from Dr. Krebs: "hypotheses must not move very far from the facts."[1] Yet advocates of chemical evolution, postulate that by chance you would get the kind of genetic information that we see in DNA and in protein molecules.

One of the other individuals present at the "Information Content of DNA" conference, was mathematician Dr. Hubert Yockey. He has calculated the

probability that one might obtain by chance the sequence of amino acids found in cytochrome c, if the appropriate twenty L-amino acids were in solution.[12] Cytochrome c is a protein of ca. 100 amino acids linked end to end by peptide bonds (C1 carboxyl group to alpha amino group). It is found in living cells, from the simplest organisms to the most complex. In making his calculations, Dr. Yockey assumes that the amino acids would react together in appropriate peptide bonds. Actually, they would not react without prior activation. He also considers, based on all the known amino acid sequences of cytochrome c in a wide variety of organisms, that any of the different possible sequences would be functional. With these assumptions, he found a probability of finding a functional cytochrome c by chance to be 2×10^{-65}. Others have calculated that if you filled all the oceans on earth with protein molecules you would require 10^{42} molecules. Is one to propose that by chance you would have not only a cytochrome c molecule, but enough other catalytically active protein molecules in close proximity to one another at the same time to have a living cell? Note that the probability of 2×10^{-65} for the formation of a single protein would be for the most favorable circumstances. If the starting materials were racemic mixtures of D- and L-amino acids, as one would expect them to be, the probability of obtaining a cytochrome c molecule with the correct sequence of 101 L-amino acids would appear to decrease from 2×10^{-65} to 2×10^{-94}.[12]

"A belief that proteins basic for life as we know it appeared simultaneously in the primitive milieu on earth is based on faith."

If we considered the possibility of obtaining a cytochrome c molecule in a solution of a hypothetical primordial soup, the presence of nonfunctional amino acids and other reacting compounds in the solution would decrease the probability even further. These probability calculations prompted Yockey to conclude: "A belief that proteins basic for life as we know it appeared simultaneously in the primitive milieu on earth is based on faith."[13] Surely, any hypothesis that has a probability of 2×10^{-65} or 2×10^{-94} or even lower, cannot be considered as scientific.

Any suggestion that chemical selectivity might greatly increase the mathematical probabilities for formation of a specific protein in non-enzymatic reactions is not valid. Depending upon the conditions, there might be slightly different degrees of incorporation of the different amino acids into a protein molecule. However, with a protein molecule of ca. 100 amino acids including all twenty amino acids, any preferential incorporation would tend to balance out; i.e., in many cases, incorrect amino acids might be preferentially incorporated. There would seem to be no reason to postulate that this could affect the overall incorporation of correct amino acids by more than a factor of ten in either direction. A ten-fold change would be minimal when related to a probability value of 2×10^{-65}. For calculation of this probability value by Yockey, it was assumed that only L-forms of amino acids would be available.[12] Consequently, another type of selectivity would relate to incorrect peptide bonding involving either the epsilon amino group of lysine or the C_4 and C_5 carboxyl groups of aspartate and glutamate.

Any suggestion that chemical selectivity might greatly increase the mathematical probabilities for formation of a specific protein in non-enzymatic reactions is not valid.

If possible peptide linkages involving these groups were considered, probability values would be reduced even further. For the probability value of 2×10^{-94}, with the assumed starting mixture of D- and L-amino acids, peptide bonds would be as readily formed by the D-amino acids as the L-amino acids. There might be some slight differences in degrees of incorporation for the L- and D-forms, but it is unlikely that these would affect relative amounts incorporated by more than two- or three-fold. In any case, chemical selectivity would be just as likely to favor the incorrect D-form as the L-form of the amino acid. As noted by Yockey, the listed probability values would give the most favorable values, with actual probabilities probably being much lower.[12]

My particular contribution to the conference in Tacoma dealt with the translation system.[14] This system involves the transfer of genetic information from a nucleic acid molecule, messenger RNA, to a specific sequence of amino acids in a protein molecule. The primary enzyme molecules in this process, the aminoacyl-tRNA synthetases are very

complicated and extremely specific. For example, in the aminoacyl synthetase of a bacteria (*Bacillus stearothermophilus*) which utilizes tyrosine, fourteen different amino acids of the enzyme molecule make up the three-dimensional site on the enzyme that binds the different substrates, and initiates catalysis of the reaction sequence. The amino acids in this three-dimensional active site on the enzyme range from position 34 to position 233 of the linear chain.[15] In the initial reactions of translation, the correct amino acids are attached to the corresponding transfer RNA molecules and not to incorrect ones. There are approximately 200 different protein molecules involved in the entire process of translation. The translation system is extremely specific and one obtains the newly formed protein molecules with amino acids in exactly the right sequence. Experimental evidence at this time indicates that this entire translation system is an absolute requirement of a living cell. You see in this case an example of a very high degree of specificity, and this specificity is an absolute requirement in obtaining a protein with the correct amino acid sequence. This translation system provides an excellent illustration of why many different protein molecules are required for a living cell, and why any suggestion that there might be life without a large number of these specific proteins is untenable.

I have cited for you only a few of the reasons why some scientists have concluded that the presupposition that life originated by chance is simply not a tenable position any more. Dr. Henry Margenau notes:

> Many of these biologists, in trying to understand evolution, are still wedded to the old-fashioned but highly enigmatic notion of chance. Almost all of them feel however, that the original Darwinian concept needs some qualification, needs an invocation of some directedness, perhaps even goal-directedness, but they are embarrassed and unwilling to call it purpose or design.[16]

Michael Denton, who also participated in the Tacoma conference, makes the following comments:

> The Darwinian claim that all the adaptive design of nature has resulted from a random search ... is one of the most daring claims in the history of science. But it is also one of the least substantiated. No evolutionary biologist has ever produced any quantitative proof that the designs of nature are within the reach of chance.[17]

> Whatever the reason for the extreme complexity of living things, there is no doubt that the level of complexity realized simply transcends all analogy and is without parallel outside the phenomenon of life itself.[18]

Dr. Peter Rust, another Tacoma participant, makes similar comments: "We have to conclude that the origin of the information contained in DNA is still a mystery ... This brings us close to stating that the Creator designed it from the beginning."[19]

This translation system provides an excellent illustration of why many different protein molecules are required for a living cell, and why any suggestion that there might be life without a large number of these specific proteins is untenable.

Denton also deals with problems of macroevolution; let me add that he accepts microevolution. I might note that many other workers in the field, Stephen Jay Gould of Harvard, for example, feel that macroevolution must have involved big jumps. Many of them feel that Darwinian natural selection cannot explain macroevolution, although natural selection may still have a role in microevolution. Denton chooses to use the term "discontinuities" to refer to these gaps or jumps in the evolutionary record. Whereas Gould still feels that the Darwinian hypothesis can be modified to accommodate these jumps or discontinuities, Denton feels that we have to take a whole new look and make major revisions in the theory. He comments as follows: "I have tried to show why I believe the problems are too severe and too intractable to offer any hope of resolution in terms of the orthodox Darwinian framework."[20]

At this time, Denton is not too specific about what revisions are needed, but he argues strongly that the current theory is seriously flawed. He points out the inadequacies of phylogenetic trees. He feels that the protein sequence data fit far better into what he calls a circumferential arrangement rather than the traditional "tree."[21] This departs from the presupposition that all living organisms were derived from some archetypal cell. He notes four different phylogenetic trees in the recent literature that differ so markedly in branching points that you would hardly recognize them. From the evidence he has cited, it is apparent that there are definitely some problems in explaining macroevolution as well as chemical evolution, and it is hoped that scientists will once again look at the evidence and evaluate carefully before accepting everything that

is presented in textbooks, and especially in the popular science magazines.

I wish to propose to you that the basic presupposition presented previously be modified. I want to introduce the term "intelligent cause" which was suggested by several of the philosophers of science at the Tacoma Conference. One of these was Dr. Robert Augros, who expresses this thought as follows: "Either there is a mind behind this universe or there is not. If not, we should find no evidence of purpose or representation in natural things. But if there is a God, nature will necessarily show signs of the Divine intelligence since every effect reflects something of its cause."[22]

The other scientist proposing the term "intelligent cause" was Dr. Charles Thaxton, to whom I have referred previously. The basic presuppositions that I am proposing are:

1. *An intelligent cause was involved in cosmological and biological origins.* Cosmological, because my understanding is that most astrophysicists agree that there is no way they can ever understand the origin of the universe. They speak of the first 10^{-35} second after the Big Bang as being totally out of the reach of scientific understanding. As astrophysicist Robert Jastro has stated: "The latest astronomical results indicate that at some point in the past the chain of cause and effect terminated abruptly. An important event occurred—the origin of the world—for which there is no known cause or explanation within the realm of science. The Universe flashed into being, and we cannot find out what caused that to happen."[23]

I feel that in regard to chemical evolution, we are dealing with probabilities that place this in the same category as the origin of the universe. This is why I include the term "biological" in the presupposition. Consequently, I am suggesting that scientists accept as reasonable the presupposition outlined above. I then suggest that the previous major presupposition be appended with a second statement as follows:

2. *Nearly everything else can be explained in terms of natural processes.* Both presuppositions are written in terms that should be acceptable to nearly all scientists.

In conclusion, I hope I have conveyed to the reader why I believe the original presupposition—i.e., that everything can be explained in terms of natural processes—is no longer tenable. I believe the evidence, if examined closely, will necessitate modification of it as I have in my second presupposition. If one wishes to argue that my first presupposition lies in the realm of religion or philosophy, I will agree, but also will note that all presuppositions are philosophical in nature. As Hans Krebs noted, all presuppositions are accepted by faith. If they prove to be contradicted by the scientific evidence, they may need to be replaced, but they should not be rejected "by definition" by claiming they are not science.

As a Christian and a scientist, I would personally modify these presuppositions further by saying that for me, the "intelligent cause" is the God of the Bible, and noting that the same God is sovereign over all of the natural processes included in my second presupposition. I would not necessarily expect those of other persuasions to agree with these latter statements. ✤

NOTES

[1]Quotations from a lecture given by H.A. Krebs at the University of Texas Medical Branch, Galveston in December, 1966.
[2]BSCS Newsletter, No. 49, 1972, p. 17.
[3]C. Hummel. *The Galileo Connection.* Downers Grove, IL: Inter-Varsity Press, 1986, p. 158.
[4]R. Nisbet. *Origins Research,* Vol. 11, No. 2, 1988, p. 1.
[5]J. Monod. *Chance and Necessity.* New York, NY: Alfred A. Knopf, 1971, Vintage Books edition, 1972, p. 112.
[6]G.G. Simpson. *The Meaning of Evolution.* Yale Univ. Press, 2nd ed., 1967, p. 293.
[7]H. Margenau. *The Miracle of Existence.* Ox Bow Press, 1984, p. 19.
[8]H. Margenau. op. cit., p. 24.
[9]H. Margenau. op. cit., chapter 2.
[10]G.A. Kerkut. *Implications of Evolution.* Pergamon Press, 1960, pp. 6,7.
[11]M. Denton. *Evolution: A Theory in Crisis.* Bethesda, MD: Adler and Adler, 1986, p. 342.
[12]H.P. Yockey. J. Theor. Biol., 67, 377 (1977).
[13]H.P. Yockey. op. cit., p. 387.
[14]G.C. Mills. Proceedings of the conference *Information Content of DNA,* "The Role of the Components of the Translation System in Information Transfer," to be published.
[15]A.R. Fersht. Proceedings of the Robert A. Welch Foundation Conference on Chemical Research XXXI. "Design of Enzymes and Enzyme Models", 1987, p. 159.
[16]H. Margenau. op. cit., p. 32.
[17]M. Denton. op. cit., p. 324.
[18]M. Denton. Proceedings of the conference, *Information Content of DNA,* "The Functional Integrity of Biological Systems: Implications for Genetic Engineering and Evolutionary Biology," to be published.
[19]P. Rust. Proceedings of the conference, *Information Content of DNA,* "The Unbelievable Belief That Almost Any DNA Sequence Will Specify Life," to be published.
[20]M. Denton. *Evolution: A Theory in Crisis,* p. 16.
[21]M. Denton. op. cit., chapter 12.
[22]R. Augros. Proceedings of the conference, *Information Content of DNA,* "The Significance of the DNA Code," to be published.
[23]R. Jastrow. *Truth: An International Inter-disciplinary Journal of Christian Thought,* Vol. 1, 1985, p. 65.

Of Dominoes, Slippery Slopes, Thin Edges of Wedges, and Camels' Noses in Tents:

Pitfalls in Christian Ethical Consistency

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It has become almost commonplace for many Christian advocates to adopt general ethical positions that rule out consideration of degrees of significance or exceptions to a universal rule. Any departure from such a universal rule is immediately decried as setting the dominoes to falling so that if the first exception or special consideration is made, nothing can prevent the ultimate collapse of all ethical considerations; carelessly sliding down the slippery slope from initial inconsistency to ethical chaos; or opening the door to ethical excesses by letting the thin edge of the wedge or the camel's nose make its first entrance. While upholding in every way the basic biblical concern for the value of human beings and human life, this paper challenges these images and suggests that greater faithfulness to our calling as God's stewards and servants follows from a view that is less dominated by a legalistic, one-sided view of the dangers, and more informed by the reality of expressing the compassion of Christ in this fallen world.

Many Christian discussions of bioethical topics adopt a view in which warnings are made against the "domino" effect of deviating from rigid regulations, or against the "slippery slope" down which we are doomed to slide if we so deviate, or against the "thin edge of the wedge" or the "camel's nose in the tent" that will threaten our society once it is allowed to enter. There is a proper area within which to express such concerns, but it does not cover every aspect of the subjects to be considered. They are often dominated by a one-sided view of all the dangers involved in a real situation. It is the purpose of this paper to warn against the simplicity of these approaches, to argue against their universal appropriateness, and to suggest that the responsible course of Christian action in these issues is, as usual, far more complex than they allow.

Informed Christians do indeed express awareness of the pitfalls of this kind of approach. Sider, for example, is aware of the problems:

> To be sure, slippery-slope arguments are treacherous. We dare not reject something good merely because it might theoretically encourage or lead to some danger or abuse.[1]

The use of such arguments is usually triggered by certain basic assumptions about why departures from a rigid approach may in special circumstances be advocated. It is commonly assumed that any deviation is based upon a non-Christian attitude, denying the value of the individual involved. Such an attitude, for example, is expressed by Grant in connection with the specific subject of euthanasia:

> The current meaning of the word (euthanasia) is "deliberate intervention to bring about the death of another human being," usually because the life of that person is judged valueless.[2]

Such semantic choices make a discussion of bioethical issues as difficult as the definition of "evolution" as "atheistic chance" does for a discussion of creation and evolution, or as the definition of "abortion" as "the murder of babies" does for a discussion of abortion issues. What is troubling about such semantic choices is that they are often made by distinguished Christian thinkers whose overall assessment of ethical issues is extremely helpful and influential.

The source of the conflict is the tension between compassionate action on the one hand, action motivated by and carried out through a dedication to Jesus Christ, and the non-Christian and even immoral excesses that such actions can lead to if left in the hands of the secular and fallen world.[3] Christian writers appear to be often reacting only to the latter of these two positions. Insofar as the danger of such excesses is often very real, their warnings are well taken and deserve to be constantly heard. But it is the argument of this paper that the desire to counteract this excessive danger must not be allowed to dominate our viewpoint so completely that we are no longer able to see the actual situation and the diversity of compassionate and realistic solutions that we are called upon to advocate as responsible Christians.

It is the intention of this paper to emphasize the following points:

- Appropriate compassion for all potential, actual and former persons.
- Distinction between biological and personal life.
- Appreciation of the realistic limits of responsible action.
- Provision of opportunities for compassion without opening the door to injustice.

In order to be responsible stewards of the world and the situations in which God places us, we must be aware of these distinctions and the alternatives implicit in them. To make no distinctions between potential, actual, and former persons; to ignore differences between biological and personal life; to pay no attention to the limits imposed on responsible action by the reality of the situations; or to exclude actions of compassion within a context that still preserves justice, are not examples of combatting dominoes, slippery slopes, thin edges of wedges, or camels' noses in tents. Rather they are examples of failure to be responsible stewards for God in the real world He has created but which today suffers from the effects of sin.

We must remain aware, on the other hand, that if we advocate exceptions for extreme circumstances, we must be no less diligent in guarding against misinterpretation of the motives for what is being advanced, and against the abuse of such suggestions that would almost certainly follow in many cases if the exception became the rule.

Pitfalls of Legalism

In almost every challenging ethical decision, traditionalists are likely to find some form of legalism extremely attractive. This is because legalism appears to be "safer" than leaving choices less rigorously limited. Legalism assumes that life is intrinsically simple and that the Christian walk can be simply defined by excluding choices that are assumed in every way and at every time to be impermissible.

In developing a legalistic approach to life's problems, those in authority do their best to codify the guidelines of the Bible into an essentially timeless set of direct "do's" and "don'ts," which then

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become the direct tests of faithfulness to Christ. An individual Christian is called upon not to evaluate a specific situation in the light of his relationship with Christ, the inputs and insights of fellow Christians in the Body of Christ, and its own special requirements, but simply to be obedient to the required list of positive and negative prescriptions. Legalistic fidelity is the most important test of faithfulness to Christ. If we take this course, then any departure looks like a falling domino, a slide down the slippery slope, a wedge inserting its thin edge, or a camel pushing his nose into the tent.

A mature Christian does not act without awareness of the law, but acts in such a way that the fullness of the intent of the law may be fulfilled.

The alternative to legalism is Spirit-guided "maturity" (Galatians 3:23-25). Christians are called upon to follow Christ in all of their lives, seeking to allow Him to live out His purpose and will through them. Christians are strengthened in the teachings and life of Christ and informed with the outlook and perspectives of the Bible. Then they are sent forth to walk a life of faith in fellowship with Christ, seeking to understand what it means in a variety of cases, many not specifically covered by the biblical text, to put those teachings and perspective into practice. To speak of a "mature" Christian is to speak of one who has the knowledge, the faith, and the relationship with Christ that makes this kind of action possible.

A mature Christian does not act without awareness of the law, but acts in such a way that the fullness of the intent of the law may be fulfilled (Matthew 5:17). Jesus provides a number of examples of such maturity in the Sermon on the Mount (Matthew 5-7) and throughout His life (e.g, Matthew 12:10-13, 23:23; Mark 2:23-27, 7:9-13; John 9:16).

The Importance of Definitions

Any appropriate standard of mature human conduct must be expressed in words and concepts that are defined in terms that conform to created reality. The limitations of a simplistic (usually legalistic) view are aggravated severely when Christians approach difficult ethical issues with faulty definitions.

A cherished biblical concept is expressed by "the sanctity of human life." Christians derive their attitude toward the sanctity of human life from the biblical teaching on the creation of man and woman in God's image, the love of God for human beings, and His concern that human practices reflect this love and esteem. We can derive powerful general guidelines from this teaching, but if we ask for specific biblical teaching on many of the ethical issues facing us, we find that instances of such teaching are few and relatively ambiguous.

What does "the sanctity of human life" mean? Does "the sanctity of human life" mean that we should try to produce as much "human life" as possible? Clearly not, otherwise Christians would have as many children as possible. Any attempt to limit procreation, even if only by abstinence, is a limitation on the expression of "human life." Mature responsibility, in a genuine appreciation for "the sanctity of human life," requires us to limit the amount of human life in existence.

"The sanctity of human life" concerns primarily our attitudes toward already living individuals with the capability of expressing human qualities. We must carefully distinguish between "human life" as the biological properties of living humans, and "human life" as the expression of humanity that flows from the development of such biological properties in the "normal" course of time.

If we ask for specific biblical teaching on many of the ethical issues facing us, we find that instances of such teaching are few and relatively ambiguous.

We value "biological life" because it is so closely related to human potentialities, and we treat it with respect. It is because of human potentialities that we are concerned for "the sanctity of human life," and not for the mere existence of "biological human life."

When the Bible speaks of *psuche*, it speaks of the "self," that central aspect of the human to which we normally give the term "personhood." Personhood is the expression of all of the human qualities

beyond those of the purely biological. It is the existence of personhood with which the "sanctity of human life" is primarily concerned.

Personhood is not expressed without the biological basis for human life, but neither does it exist automatically simply because biological human life is present. It is a central property of a mature human individual. It comes into being gradually with the passage of time during the biological development of the individual, and it ceases to exist when the biological functioning is no longer appropriate to sustain it. For its expression, it depends upon a degree of biological development that is consistent with it.

Personhood is not expressed without the biological basis for human life, but neither does it exist automatically simply because biological human life is present.

We cannot speak meaningfully of a creature "thinking" before a working brain has been formed, of having emotions before a central nervous system has come into being, or of making responsible choices before the neocortex (that part of the cerebral cortex peculiar to mammals and human beings that is responsible for the higher mental functions) is active. Nor can we speak meaningfully of the existence and sanctity of personhood in an individual for whom all brain activity has irreversibly ceased, regardless of the continuation of other biological life processes.

Now the usual warnings against dominoes, slippery slopes, thin edges of wedges, and camel's noses frequently ignore all of these distinctions. They commonly speak as though all human life were personal human life, as though the nature of the human life of an individual did not have significant differences with time as the related biological structures develop, and as though efforts to delineate distinctions between non-personal and personal were totally misguided.

Biological Development and Decay as Process

For a more appropriate assessment of ethical issues involving human beings it is essential to realize that pregnancy-to-birth-and-beyond is a process and that dying-death is a process. Legalistic thinking tends to assume independent and discrete events; mature responsibility requires that we recognize the role of process in the created world.

Understanding the nature of the process that leads from a fertilized ovum to a responsible human person is essential for an evaluation of ethical issues. At every stage of biological growth and development, new properties come into being for the developing fetus. There are significant beginnings at every stage of development through the entire gestation period and extending beyond birth. No dramatic transformation of brain activity (of capability for expression of personhood) occurs even at birth. It is not until the tenth day after birth that the neocortex shows sign of change, and the neocortex does not begin to come into action until five weeks to seven months after birth.

Much confusion in many debates in which the terms "living," "human," and "person" are frequently used unthinkingly, could be avoided if we assessed their meaning with a little care and perception. Following are a few crucial suggestions.

(1) The sperm and the ovum that meet to form the fertilized ovum are themselves already alive. The moment of fertilization of the ovum marks the beginning of a new living entity. No confusion or uncertainty is involved. Debate about when life starts is unjustifiable. Similarly, there need be no confusion or uncertainty about when life ends. Life ends when the last biological process (e.g., growth of nails or hair) in a corpse ceases.

For a more appropriate assessment of ethical issues involving human beings it is essential to realize that pregnancy-to-birth-and-beyond is a process and that dying-death is a process.

(2) Someone might suppose that at some time in the development that follows conception there might be a period when the fetus is not human, and then a later period when it is. The confusion here results from our ambiguity about the meaning of the term "human." Fundamentally "human" is a biological distinction: a creature is "human" if it has the genetic

structures characteristic of *Homo sapiens* and it is not human if it does not. If we ask, "When does human life begin?" the answer is again perfectly clear and undebatable. Human life begins at conception. One second after conception the fertilized ovum is as "human" as any "one-second-old fertilized ovum" will ever be. Similarly the answer to the question of when human life ends can be clearly given: human life ends when life (as in (1) above) in a human being ceases.

(3) One of the difficulties is that when the questions, "When does human life begin?" or "When does human life end?" are asked, the asker may really have quite a different question in mind, namely, "When does human personhood begin (or end)?" These are two quite different questions: the discussion of human life is not the same as the discussion of human personhood. No recourse to the argument that the definition of "personhood" is too ambiguous to be useful can be used as a legalistic guide for ethical actions through the simplistic identification of "human life" with "living human person."

(4) The continuity of the biological process affords no simple transformation in basic properties at birth or death. Therefore, continuity of biological process affords no meaningful argument, to maintain the sanctity of life of a fetus immediately after birth, while denying the sanctity of life of a fetus immediately before birth.

When the questions, "When does human life begin?" or "When does human life end?" are asked, the asker may really have quite a different question in mind, namely, "When does human personhood begin (or end)?"

(5) At the same time, however, we must be careful to avoid the "fallacy of the continuum." This argues that since the infant clearly has a "right to life," and since there is a continuous process leading from the fertilized ovum to the infant, the newly fertilized ovum has *the same* "right to life" as an infant. This approach neglects the complex process of development that takes place in time, which radically changes the properties of the unborn in the period between fertilization and birth. Although the fetus at birth is still only *potentially* a "human person," it is orders of magnitude closer to that state than is a newly fertilized ovum.

The comparable argument at the end of life is that since the living human person has a "right to life," and there is a continuous process leading from the living human person to the human creature with biological life only, the human with biological life after the cessation of personal life has *the same* "right to life" as a living human person. After the cessation of personal life, the still living human is a *former* "human person." At both ends of human life, biological life exists without personal life.

At both ends of human life, biological life exists without personal life.

(6) Too much significance cannot be attributed to the fact that the fetus has various behavioral patterns that *look like* those of an infant, such as thumb sucking or eagerly swallowing amniotic fluid injected with sugar. An anencephalic (a fetus without a developing brain) which has *no chance* of developing into a person, will do the same. Similarly too much significance cannot be attributed to the fact that the human after the irreversible cessation of personal life still exhibits biological reactions to stimuli, or growth of nails or hair.

(7) The acceptance of organ transplants forces us to make a distinction between "biological life" and "personal life." In fact, the taking of an organ for transplant requires us to have determined that the "personal life" of the donor is ended, and that the "biological life" has not.

What then do we make of all these complex inputs in our effort to live out a responsible Christian life? We strive to respond maturely to the reality of the situation, while also keeping significant distinctions in mind. We recognize that many ethical dilemmas need a case-by-case evaluation, as has been argued and illustrated by Gardner,[4] and cannot be settled once and for all by laying down rules without possibilities of nuance.

Since the "beginning" or "ending" of personal life is a continuous process that cannot be associated with a single discrete event or development, we start by ascribing a sense of profound value to every kind of human life, whether pre-personal, personal, or post-personal. Although "personal life" is the

focus of biblical teaching on the value of human life, we ascribe unique value to human life before the full development of personal life, and to human life after the cessation of personal life, out of a sense of reverence for all human life, through what Wennberg has called the "overflow principle."[5] Our sense of the sanctity of personal human life "overflows" to include non-personal (such as the anencephalic), pre-personal or post-personal forms of human life. We do not condone the ending of the pre-personal life of the fetus for reasons simply of human choice or convenience, nor do we condone the disrespectful treatment of post-personal human life or even of corpses themselves.

But at the same time we do not totally forget the real distinctions between non-personal, pre-personal and post-personal when conflicts arise between different stages of human life. All human life demands to be treated in a way consistent with its value, but all human life does not demand to be treated in the same way. It is in these difficult interactions that the working out of Christian principles and ethics is put to the test.

Denigration of Life vs. Compassion for Life

Another common pitfall in discussions of dominoes, slippery slopes, thin edges of wedges, and camels' noses in tents is the assumption of unworthy motives for those who advocate deviations from an inflexible ethical code. It is important to realize that such advocates—even if their recommendations should be judged ultimately unacceptable—often do not act at all from the unworthy motives ascribed to them.

The Example of Abortion

What are some of the unworthy motives ascribed to those who are willing to consider the possibility of abortion in suitable cases of exceptional need? They are said to consider the unborn to have no intrinsic value, but to be only a physical appendage of the mother's body, totally at her whim to nurture or destroy. They are said to be concerned only about getting rid of an unwanted problem, a potential burden, or an inconvenience that could have been responsibly avoided in the first place by abstinence or contraception. They are said to be concerned only with their own selfish convenience or pleasure, and to be unwilling to be bothered with the trouble associated with the completion of pregnancy. In the event that abortion is requested because of severe disease, malformation, or dysfunction of the unborn, they are charged with destroying human life because their own life might be troubled or inconvenienced by the care and love that would be required. In brief, they are said to be involved in the denigration of human life in order to preserve their own selfish desires.

In a not insignificant number of cases where abortion is considered, however, it is not a denigration of human life that is the motivating factor, but mature compassion for human life. The importance of the motive of compassion must be realized if we are to evaluate responsible Christian attitudes toward abortion and related issues. The following set of guidelines is proposed.

(1) The attempt to use a single term "abortion" for any act of terminating the life of a zygote, embryo, or fetus is consistently misleading. To suppose that ending the life of a 2-day-old fertilized ovum can meaningfully be called by the same name (with the same meaning) as ending the life of an 8-month-old fetus is to obscure the total issue. Mature Christian responsibility must recognize the significance of "process" in the development of the unborn.

(2) Because the unborn is both living and human, abortion is always a serious matter and a moral decision. The future of the unborn is not to be decided by the whim of any human being, even the mother.

In a not insignificant number of cases where abortion is considered, however, it is not a denigration of human life that is the motivating factor, but mature compassion for human life.

(3) The unborn is involved in a process of becoming personal as its capability for personhood develops with its biological framework, a process that is not completed until well after birth. It is therefore appropriate to view early abortion as the ending of human life, but not as the ending of personal life. Compassion for existing personal human life in extreme cases (incest and rape, and the reduced responsibility of minors, the retarded, and the emotionally and psychologically disturbed) may lead us to allow the ending of the human life of the unborn at an early stage of development. Likewise,

compassion for the unborn may lead us to end the development of the pre-personal unborn under circumstances in which continued development would almost certainly lead to severe suffering of a personal human life.

(4) In many cases (psychological problems of the parents, abnormality of the fetus, etc.) abortion can be viewed either as (a) a way to escape from the burdens of caring for a human life that God has given to a couple in order to test, strengthen, and then bless them; i.e., a way to escape selfless sacrifice, care for the defenseless, and redemptive suffering, instead of accepting these burdens in faith; or (b) a way to exercise human stewardship before God in such a way that the normal commitments to the reduction of human disease and suffering (both that of the developing unborn and that of the family in which the pregnancy has occurred) are extended to the area of terminating the life of the pre-personal unborn, before it develops to the state where personal suffering, limitation, and deprivation have meaning.

Mature compassion for all personal human life leads to the recognition that the simple forbidding of all abortions by no means guarantees a major increase in social awareness and honoring of the value of personal human life.

Few, if any, informed Christians would consider it morally objectionable to abort a fetus that has *no prospect* for personal existence; nor should a person who has such an abortion be charged with prejudice against the handicapped. Most persons would take means to prevent conception of severely handicapped children if they could, and would not thereby be charged with prejudice against the handicapped. Also, rejecting the *prospect* of having a handicapped child should not be identified with rejecting the handicapped child that one *now* has. Clearly these are very complex issues that must be decided by each couple before God and their community of faith. Those who make the choice of (a) should receive every support and sustenance that their community can provide; those who make the choice of (b) also need that same support and sustenance.

(5) Mature compassion for all personal human life leads to the recognition that the simple forbidding of all abortions by no means guarantees a major increase in social awareness and honoring of the value of personal human life. If abortions are forbidden, then babies are born. If the cancellation of the evils of uncontrolled abortion leads to similar or even greater evils of uncontrolled child neglect, abuse, abandonment, corruption, and suffering, then no major ethical advance has been made. It is clear that the route toward the highly desirable control and limitation of abortion must be coupled strongly both with intense efforts toward the voluntary use of contraceptive methods, and with intense efforts toward providing a framework for the care of poor, underprivileged, neglected, and unwanted children. In the event that either of these last two avenues is severely limited or unpracticed because of social mores, extremely careful and judicious thought must be taken before forbidding at least early abortions.

The summary of the case presented here is simply that opposition to the forbidding of all abortion can arise just as persuasively from mature compassion for personal human life flowing from a responsible Christian approach to life as from a callous disregard of the value of the fetus. It does not help Christian discussions of the issue to attribute only base motives to those who are willing to contemplate an abortion exception without capitulating to fears of dominoes, slippery slopes, thin edges of wedges, or camels' noses in tents.

The Example of Euthanasia

What are some of the unworthy motives ascribed to those who would consider taking a more or less active role in euthanasia, allowing or helping a human person to "die well"? They are charged with utilitarian motives that declare the ill or incapacitated person to be useless to society, and capable of serving only as a burden to society—hence to be done away with quickly and quietly to save the trouble of continued care and expense. Again, they are charged with the denigration of human life in order to preserve their own selfish desires.

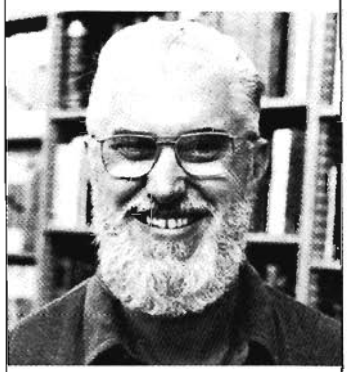
Any informed discussion of the issues of euthanasia, of "dying well," must again recognize that attitudes toward euthanasia may be as often motivated by mature Christian compassion as by these kinds of unfeeling denigration of human value.

(1) The medical profession tends to find itself by

SEARCH

Scientists Who Serve God

He's Fond of Photons



Photons are "particles of light energy." Their interactions with solid materials have interested Richard H. Bube for nearly fifty years. Bube (pronounced "Byoub") is professor of materials science and electrical engineering at Stanford University in California.

Physics: Getting Excited

Dick Bube was born in 1927 in Providence, Rhode Island. For his freshman English class at Brown University in Providence, he wrote a paper on "cold light." The young physics major, you might say, got excited about excitation.

Excitation is a term physicists use to describe the raising of an atom or molecule to a higher-energy state. When excited atoms return to their normal state they emit photons, a process called luminescence. A glowing flask of chemi-luminescent "cold light" is a big hit in science shows. On summer nights bio-luminescent fireflies blink at each other. In fluorescent lights, atoms of mercury vapor excited by electrons emit invisible ultraviolet photons, which excite solid materials coating the tube, which in turn emit lower-energy visible photons. In neon lights the visible light is the output of the gaseous elements themselves. In a form of luminescence called phosphorescence, the light lingers longer after excitation stops.

Dick Bube's excitement and output both lingered. He continued to study luminescence at Princeton University, where he earned an M.A. and a Ph.D. in physics. When he received his Ph.D. in 1950 he had already been working two years on the technical staff of the RCA Laboratories in Princeton. He had also met Betty Jane Meeker and married her (in 1948). From 1948 to 1962 Bube managed a research group at RCA investigating photoelectronic materials. They were especially interested in what might be called the opposite of luminescence: materials whose electronic properties changed when they absorbed photons.

Materials Science: Transition to Academic Life

Technical papers, patents, and his 1960 book, *Photoconductivity of Solids,* earned Richard Bube a reputation in his field. That book, recognized as a classic, was translated into Russian in 1962 and was reissued in this country in 1978. Bube was invited to Stanford as an associate professor in 1962 and became full professor in 1964. From 1975 to 1986 he chaired the Department of Materials Science & Engineering. Fifty students have received Ph.D. degrees under his direction. For the past decade Bube has focused on the photovoltaic effect—on which solar energy cells depend.

As a physicist-turned-materials-scientist, Professor Bube has been working hard to help make solar energy a viable alternative energy source. As a Christian serving God through scientific work, he plays another significant role: exploring what it means to know Christ as personal Savior in a technological age. He puts a lot of thought into presenting and clarifying the gospel to students, colleagues, and the general public. His 50th doctoral student was a seven-year veteran of InterVarsity Christian Fellowship staff work. Besides Bube's four published texts on solid-state physics (each of which begins with a verse of scripture), he has written many articles and five books on Christian faith and its relation to science.

Richard Bube has been a Christian for most of his life. He's still excited about that. Ω

Scientific Investigation

Putting Sunlight to Work

Much of the energy available on earth does come from the sun. Hydroelectric power depends on the sun's heat to evaporate ocean water so it can rain down above dams and flow through electricity-generating turbines. The fossil fuels on which we live so lavishly were once "biomass" nourished by photosynthesis, then heated and compressed into coal and oil. As petroleum supplies dwindle, we must tap the sun's energy in more immediate ways. Solar cells produce electricity directly but are now too expensive for all but special uses, such as running pocket calculators or satellites.

Photovoltaics in Theory and Practice

Solar batteries are photovoltaic devices based on the "photoelectric effect" studied by German physicists at the turn of the century. Heinrich Hertz first noted the effect in 1888 and Phillip Lennard concluded that electrons were emitted by certain materials when light fell on them. In 1900 Max Planck gave his name to Planck's constant, relating the energy of radiation to its frequency. By putting it all together in 1905, Albert Einstein laid the foundation for the new quantum theory.

The same phenomenon whose explanation revolutionized theoretical physics has practical importance in today's search for renewable energy sources. Solar cells require a junction of two suitable materials so that photons can "push" negatively charged electrons into one of them, leaving "positive holes" of missing electrons in the other. Movement of the electrons and "holes" (in opposite directions) constitutes an electric current; their accumulation on opposite sides of the junction produces an electric voltage. Single-crystal solar cells are made by diffusing impurities into hole-controlled or positive (p-type) silicon to convert a thin layer into electron-controlled or negative (n-type) silicon. Or two completely different materials can be joined, such as (n-type) cadmium sulfide plus (p-type) cadmium telluride or indium phosphide.

Needed: Both Science and Engineering

Professor Bube and his associates investigate new kinds of photovoltaic combinations to see what happens at their n-p junctions, hoping to increase solar-cell efficiency. In the best solar cells now in use, about 30 percent of the radiant energy is converted into electrical energy. Bube's research group pays special attention to thin-film polycrystalline or amorphous materials. If certain problems can be overcome, solar cells using such materials could be manufactured at much lower cost than single-crystal cells. Electric power generation by huge solar collectors would then be economically competitive.

Richard Bube already has over 250 research publications and three patents on photoconducting materials and devices. He has written three technical books in addition to his 1960 text on photoconductivity: *Electronic Properties of Crystalline Solids* (1974), *Electrons in Solids* (1981; 2nd edition, 1988), and *Fundamentals of Solar Cells* (1983), the latter written with a current coworker, Dr. Alan Fahrenbruch.

Has Bube thought about retiring? Well, yes, but there are always some new experimental results that need looking into. Being able to make cheap, efficient solar cells wouldn't solve all of our energy problems, he admits, but "it would be nice to get that far before we run out of oil."

Ω

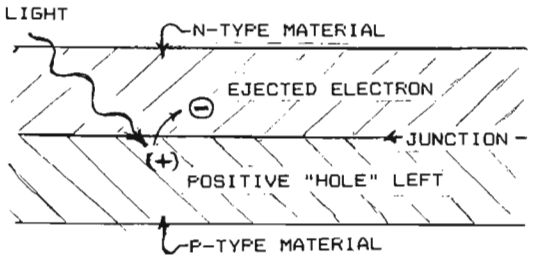


Diagram of the action in a typical photovoltaic cell, as solar radiation is converted into electrical energy.

"VERUM DICIT"

Some big American universities have begun to admit that they've neglected teaching. Well-known professors may insist that teaching undergraduate classes would take too much time from their research. Others do teach, even though rewards and prestige are more likely to come from research. Some, like Dr. Richard Bube, transmit wisdom as well as knowledge to students.

In 1967, Bube initiated a 10-week, academic-credit, elective seminar at Stanford on "Issues in Science and Religion." Each year between 15 and 25 students, most of them with some personal connection to Christianity, have chosen the seminar and then shared their enthusiasm with the next generation of Stanford undergraduates.

Participants have examined ethical issues from the viewpoints of science and of Christian faith, writing papers on their own integration of those insights. Bube's seminar dispels the mistaken idea that one must make a choice between "science and the Bible." Both are important.

Many colleges and universities have Latin mottoes like *Fiat Lux* ("Let there be light") or *Lux et Veritas* (Yale's motto, "Light and Truth"). Dick Bube studied at Brown (*In Deo Speramus*, "We trust in God") and Princeton (*Dei Sub Numine Viget*, "He grows strong in God's presence"), and teaches at Stanford (*Verum Dicit*, "He speaks the truth").

Stanford's expert on photoelectronics knows what truth is all about. *Verum Dicit.*

Theological Reflection

The Light of the World

The Bible is full of references to light, from "God said, 'Let there be light'; and there was light" (Genesis 1:3) to the final prophecy of a new heaven, new earth, and "New Jerusalem," a city with no need of sun or moon, "for the glory of God is its light, and its lamp is the Lamb" (Revelation 21:22).

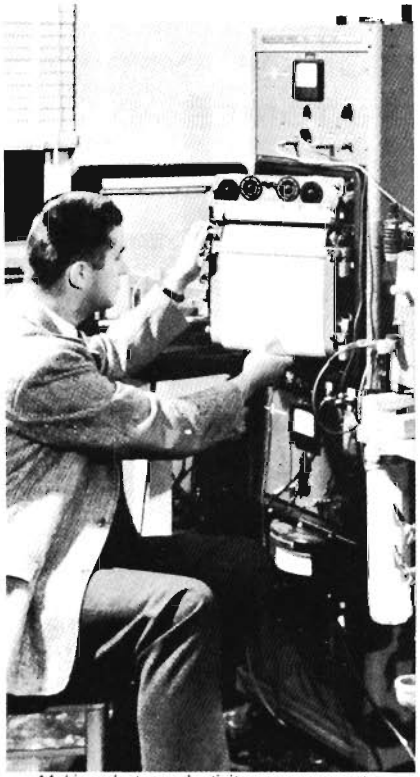
Jesus Christ, Light of the World

One biblical use of the word *light* is still common, as a metaphor for revelation, or "enlightenment." We say that a lecture "shed light" on a subject, or was "illuminating." Biblically, light also stands for God's moral perfection, or goodness in a more general sense. It is frequently contrasted with the darkness of evil, accompanied by warnings not to let God's light flicker out (Luke 11:33-35).

In John's Gospel, both meanings are applied to Jesus Christ. As the *Logos* or "living Word," Christ was in on God's creative activity (John 1:1-5), then came into the world as "the true light" to enlighten all people. Further, "to all who received him, who believed in his name," his life of grace and truth became our light (John 1:6-18), which can be passed on. Christians are called "children of light" who belong to the day (1 Thessalonians 5:4-11) and should "cast off the works of darkness and put on the armor of light" (Romans 13:11-14).

How Does the Creator Interact with the Created World?

Science began several hundred years ago with a focus on mechanics. In the 20th century, relativity and quantum theory upset classical cause-and-effect determinism. Einstein's work on the photoelectric effect was one of the first indications that the physical world is not a simple "clockwork." When mass turned out to be equivalent to energy, a world of events or relationships (or "information") began to make as much sense as a world of material particles.



Making photoconductivity measurements at RCA Laboratories in Princeton, New Jersey, 1959.

The Bible pictures God as *transcendent* (above and beyond his creation), but at the same time *immanent* (interacting with it in significant ways). One challenge for Christians in an age of science is to find ways of decribing God's action in the world that mesh with, or at least do not violate, what we know to be true from science. Because God is transcendent, any description of God's influence must be in the form of an analogy or metaphor, but it should be a *good* metaphor.

One can be sure that a Christian materials scientist like Richard Bube, as he investigates how light causes its effects in physical materials, also thinks about how "the Light of the world" puts grace and truth to work. When believers are spiritually enlightened, for example, what happens? We know the importance of "junctions" in solar cells; could it be that a dual kind of contact (with the world in one direction and the Holy Spirit in the other) is necessary for Christians to function as effective "cells"? As an individual, how does one become more efficient at converting "light from the Son" into good works? What happens when individual cells are linked together to form the "body of Christ" (1 Corinthians 12:27)?

The church, functioning properly, seems to bear some analogy to a large array of solar cells—an alternative source of power (Acts 1:8).

Ω

"LET IT SHINE"

"This little light of mine, I'm gonna let it shine." So goes a children's Sunday school song about being a faithful witness. Richard Bube has let his faith shine through five specifically Christian books. In fact the first book he wrote was *A Textbook of Christian Doctrine* (Moody, 1955).

The Encounter Between Christianity and Science (Eerdmans, 1968) and *The Human Quest: A New Look at Science and Christian Faith* (Word, 1971) were both major contributions. Regrettably, both went out of print after selling only a few thousand copies. (That happens to many good books on science and faith these days, partly because of a change in the way publishers' inventories are taxed.)

Still available (from ASA, address on p. 4) is *Science and the Whole Person: A Personal Integration of Scientific and Biblical Perspectives* (ASA, 1985), a collection of Richard Bube's articles from the *Journal of the American Scientific Affiliation*. He edited that journal from 1969 to 1983 and still contributes articles and reviews to it. The ASA journal is now called *Perspectives on Science and Christian Faith*.

Not yet in print is Bube's most recent book, *Shaping the Future: Modern Science and Christian Choices*.

Christians in technical occupations are concerned about being whole persons, but may differ in the way they look at their careers. Some strive to use their training to meet human needs in practical ways. Others place importance on bringing biblical insights to their profession, or on bearing witness to the scientific or academic communities. Some see their calling as no more specialized than that of other Christians, simply to live out the gospel within one's family, church, and community.

A Special Kind of Generalist

"Hey, no fair! Dick already stands 6'7" to Betty's 5'2"."

Stanford professor Richard H. Bube has done all of those things. In his technical work he has ranged from the highly theoretical to the intensely practical. He has written theological works but also served the church in ordinary ways, teaching Sunday school classes and sponsoring campus Christian groups. He and Betty have raised two sons and two daughters: a lawyer, a mathematician, a psychologist, and an accountant.

Dick Bube has contributed his editorial skills not only to the Christian *Journal of the American Scientific Affiliation* but also to the *Annual Review of Materials, Materials Letters,* and *Solid-State Electronics.* He has presented papers both at Christian conferences and at many science and engineering societies. He has given technical lectures at various American and European universities but also taught at Fuller Theological Seminary and Regent College. He has lectured on science and Christianity at over 60 colleges and universities, frequently as a Staley Distinguished Christian Scholar Lecturer. He has served as elder, teacher, or lay preacher in local churches affiliated with Lutheran, Presbyterian, and Covenant denominations.

Needed: Both Evangelism and Social Responsibility

In *The Encounter Between Christianity and Science* (1968), Bube wrote that although the church's basic responsibility is to lead people to Jesus Christ, that responsibility cannot be met if each individual Christian is not fundamentally concerned about the needs of the whole person and of society. In 1985 he made a similar plea for balance in *Science and the Whole Person.*

Bube has also addressed a specific group of Christian young people, those who might want to follow in his academic footsteps. He called a recent article "So, You Want to Be a Science Professor!" and subtitled it "The Education Business: Things My Mother Never Told Me" (*Perspectives on Science and Christian Faith,* Sept 1989, pp. 143-151). After offering much practical advice, he concluded this way:

> "There are few greater challenges than for a Christian faculty member to stand gently firm for Christ in the midst of a secular campus. Among colleagues whose academic achievements are an almost impenetrable insulation against the message of the gospel, he [or she] lives daily to be heard and known as a person of integrity and intellectual responsibility, who can be trusted in professional and personal matters, but who calls colleagues and students alike to a higher relationship and a more encompassing good. There are few greater challenges—but there are few greater opportunities."

Let your light so shine before [others], that they may see your good works and give glory to your Father who is in heaven (Matthew 5:16).

Ω

Thoughtful Worship

Science and the Whole Person

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practice and often by law pressed into a consideration of *only* biological factors. Given the technological possiblity of sustaining biological life, medical staff find few alternatives except to apply this technology to its fullest (as long as competition among several patients for its application is not a vital factor in the decision). As medical technology advances, the problem becomes more critical; we may approach the day when we are able, if we choose, to maintain biological life in a majority of cases well beyond the termination of personal life, or in situations where personal life will never be experienced. It becomes increasingly important for genuine regard and mature compasson for personal human life and the welfare of the whole person to safeguard against these trends.

Given the technological possiblity of sustaining biological life, medical staff find few alternatives except to apply this technology to its fullest.

(2) It is often mature Christian compassion and not denigration of the value of the individual that leads to efforts to help an individual to "die well" rather than to subject him to fruitless and usually depersonalizing efforts to maintain his life. So many of the techniques for prolonging life in the case of terminal illness have the effect of sustaining biological life, but of destroying personal life. Instead of being sustained in a friendly atmosphere surrounded by those whom the patient loves and cares for, the patient is isolated in a sterile hospital room separated from any personal contact except that of busy impersonal technicians, and is subjected to drugs and medical apparatus with its tubes, needles, catheters, etc. which reduce the patient to a biological mass incapable of dignity, self-expression or personal relationships. A misguided reverence for biological life that leads us to go to all lengths to preserve it actually involves us in an assault on a person. It is mature compassion and a keen awareness of the genuine value of the individual that leads us away from this course of action. A beautiful case story is told of the death of Francis Schaeffer by his wife Edith.[6]

(3) The process of helping a patient to die well by respecting his wishes and not necessarily invoking extraordinary measures to sustain biological life is often called "passive euthanasia." It is called "euthanasia" because specific measures are not used to prolong life; it is called "passive" because specific measures are not used to shorten life. Such a distinction overlooks the fact that when measures are not used to prolong life, this omission in itself is a measure to shorten life. Attempts therefore to always make a sharp demarcation between "passive" and "active" euthanasia may be inappropriate. The choice of a patient not to enter into treatment but into a pattern designed to help him die well, does not appear to have any major ethical difference with the choice of a patient to terminate treatment already begun. Certainly either choice made on behalf of a patient unable to make the choice for himself can reflect mature compassion and concern for the value of the dying person and not simply a desire to get rid of an unpleasant situation and a valueless individual.

It is the goal of Christians to contribute to the authentic "dying well" of those who are terminally ill and beyond the meaningful help of medical treatments. This goal involves attention to the stated desires of the person himself, and/or his loved ones in the event that the person has not expressed himself or is not able to express himself. It also involves expressing genuine care for the whole person, and not just for the maintenance of biological life. Christian involvement in the hospice movement is one example of a response to the situation characterized by mature compassion.

So many of the techniques for prolonging life in the case of terminal illness have the effect of sustaining biological life, but of destroying personal life.

Any participation in euthanasia by a Christian should be directed solely by compassion and concern for human persons, primarily for the person who is terminally ill and those affected by his life and death. Of course euthanasia in a Christian framework cannot be practiced against the wishes of the terminally ill person in order to make life easier or less expensive for the survivors. If it is to be practiced at all, then it is practiced on behalf of the person who is terminally ill. We help him to "die well" because we love him.

Suppose even that one were willing to admit that there might conceivably be some exceptional and unusual cases where what might be construed as "active" euthanasia might be lovingly and mature-

ly carried out. It would still be true that Christians should oppose the general legalization of active euthanasia, in the expectation that the number of cases in which it would be misused and abused would far exceed those few exceptional cases where it might be properly used. But it leaves open the possibility that there might be a way to legally constrain the exercise of the exceptional action that the needs of that exceptional case and the needs of the usual case might both be met. It isn't necessary to close one's eyes to the dangers of falling dominoes, slippery slopes, thin edges of wedges, and camels' noses in tents to be willing to foresee and provide for genuine exceptions authentically motivated by love and compassion.

Problems Generated by Increasing Scientific Ability

Some of the problems of the type discussed in this paper arise with increasing urgency today because of the striking advances made in our scientific ability to preserve at least biological life in circumstances where only a few years ago leaving the matter "in the hands of God" would have inevitably led to rapid and unquestioned death.[7] It is at the cutting edge of these possibilities that the tension between a legalistic approach and an approach fulfilling mature Christian responsibility is most clearly realized.

If "the sanctity of human life" is mistakenly taken to mean the sanctity of all human biological life, there is no end to the ethical dilemmas that we will shortly face.

This is one of the reasons that differentiation between non-personal biological life and personal life is so critical. If "the sanctity of human life" is mistakenly taken to mean the sanctity of all human biological life, there is no end to the ethical dilemmas that we will shortly face. We will be driven to expend vast amounts of effort and financial aid in increasingly more difficult cases of preserving and extending non-personal biological human life, an effort that will have the practical effect of depersonalizing our society and contributing to the loss of the authentic sanctity of personal human life.

This is not the first time that unassailable human motives have contributed to socially destructive and painful consequences simply because of our finite knowledge, foresight and ability. The frighteningly large proportion of starving people in the world today, especially among children, is a direct, though obviously totally undesired, consequence of major medical successes in reducing deaths during pregnancy, childbirth, and early childhood. Similarly the growing problem of a larger proportion of physically and personally suffering elderly in our population is a direct consequence of major medical successes in extending the average lifespan by control and conquest of diseases and physical conditions that earlier took many of these lives and were accepted as "the will of God."

"How do we continue to provide the treatments of medical technology when the funds to pay for them are not available from any source?"

The assumption that the extension of every human life in every conceivable circumstance is always a positive goal for a society concerned with the lives of many human persons is a highly questionable one—at least unless we undertake major efforts to meet the new challenges to the sanctity of human life that often result.

Two major problem areas can be defined. First there is the question of whether we *should* do something simply because now we *can* do it. Simplistic yes or no answers fail rather badly unless we look fairly carefully at the actual situations being considered. We may well find that in some areas the pursuit of the possible may undermine the very values that we seek to uphold. An authentic desire to uphold the sanctity of personal human life, coupled with a real sense of compassion and responsibility for such personal human life, may lead us not to do some of the things that we may become able to do.

Second, we will certainly come up against the very practical question of the expenses involved; as techniques become more sophisticated, their cost increases—they cannot be extended to greater and greater numbers of patients without limit. We may simply have to face the question head on: "How do we continue to provide the treatments of medical technology when the funds to pay for them are

not available from any source?" At what point does the concentration of resources on one highly visible and scientifically interesting case justify the necessary withdrawal of support from a hundred other less visible and less scientifically interesting cases?

Should We Do What We Can Do?

As far as our technical ability is concerned, we could remove the processes involved in conception, fertilization and implantation further and further from the loving context of the family and into the safer and more efficient environment of the laboratory. Should we further such efforts?

By the application of new technology, we probably will have the ability to keep alive every fetus from the third month on—or perhaps even earlier—no matter how malformed, handicapped, dysfunctional, or lacking in ability to develop into a human person, and even though many will live for only a few years of severe suffering for themselves and their families. Should we further such efforts?

Sophisticated modern technology has the ability to maintain human biological life even beyond the termination of personal life. Should this be the normal course for everyone? It even appears possible to maintain biologically alive the corpses of previous persons for years after personal death has occurred—and all this for the benefit of humanity since such corpses could be used in a cost-effective way for training medical students, testing drugs and surgical procedures, medical experiments, as organ and blood banks, and as manufacturing units for antibodies. Should this be a social priority? Gaylin expresses a cogent reaction to such elevation of technology—even for the benefit of human persons, "Sustaining life is an urgent argument for any measure, but not if that measure destroys those very qualities that make life worth sustaining."[8]

How Much Can We Responsibly Afford?

When every human life has infinite worth, the extension of that human life is worth an infinite cost. Unfortunately, we cannot escape the ultimate conclusion that we cannot afford to pay an infinite cost, because we are only finite creatures. We are driven against our wills to consider the mundane matter of the cost of such technologies and the choice of a pattern of response that is both responsible and affordable.

Roberta Friedman describes one aspect of this problem. " 'We can keep a human life going for as long as we have to,' says Stanford intensive care nursery (ICN) coordinator Rose Ann Petersen, 'But who is willing to pick up the price tag?' "[9] This article goes on to point out that the first week of ICN care often costs more than $12,000 a day. One family whose twins spent nine weeks in the hospital's ICN were billed $225,000. Often with minimum coverage by insurance, families face the need to sell off all of their assets or to enter into a lifetime of debt. But this is not the end. The cost of care after the baby is sent home continues at an astronomical rate. Petersen estimates that raising a baby with cerebral palsy to age 21 may cost $40,000 a year in hospital costs alone. Efforts to preserve life lead to the meeting of the initial astronomical expenses—but few are prepared for the costs needed to maintain that life in a meaningful way.

The message in this case is that premature birth should be avoided by major efforts at improved and increased prenatal care: "The cost that one preterm infant generates could provide routine prenatal care for 25-30 women." These figures are startling in themselves. We do not need to be prophets, however, to realize that increasingly refined technology to do increasingly difficult jobs will have increasingly high price tags.

"We can keep a human life going for as long as we have to, but who is willing to pick up the price tag?"

Dr. Ernie W. D. Young also describes the problems we face with the increasing cost of higher technology health care:

> The cost of rescuing very-low-birth-weight premature infants is approximately $50,000 per survivor, with total expenditures of $500,000 being common. Seldom are the parents asked to meet such staggering bills—these amounts are commonly paid by the state. In addition, there is no way of calculating the emotional cost to parents and siblings of providing lifetime care to a child who survives with major disabilities—yet these costs are real. ... At the other end of life, it is a well-established fact that the bulk of medical expenditures occur during the last year of life. The price of adult intensive care is substantial: the bed alone can cost $2,000 per day! To this amount must be added operating-room charges, physicians' fees, the cost of medications and incidentals.[10]

Young again emphasizes the present serious failure and the major need for the prevention of prematurity in the first place.

Concerning care for the elderly he points out the

growing proportion of national spending on their care, so that in 1985, after a rapid expansion, 28% of all federal spending went to the 12% of the population that were over 65. Intensive care for the elderly may be something that our society simply cannot afford by early in the next century. By the very desire to lead responsible lives and make choices consistent with faithful stewardship of resources, we may be driven to the conclusion that we should do the best we can to alleviate the sufferings of the elderly within the context of upholding their choice, human dignity, and value, but that heroic attempts to solve a problem that has no genuine solution may well fall into the category of unethical.[11,12]

Ardent advocates against any departures from standards that attribute essentially infinite worth to every human life, see such departures as the beginning of falling dominoes, sliding down slippery slopes, letting in the thin edge of the wedge or the camel's nose into the tent, leading to inevitable degradation of society, denigration of human value, and loss of those aspects of human life that make it truly sacred. Insofar as they are right in these fears—and there is no question but that severe dangers exist—we would not hesitate to agree with them.

But their choice sees only one set of dangers and ignores the equally tragic results of being unwilling to meet more compassionately and realistically the authentic ethical issues being raised. They fail to see that the call for Christians to act in exceptional cases may be motivated by mature compassion and concern for the sanctity of life and the dignity of the human person, not by a sense of the valuelessness of life or a desire to abandon needy persons.

Dominoes fall, slippery slopes slide, thin edges of wedges and noses of camels push in—in both directions. Once we make legalistic safety the ultimate test of all social actions, we make expressions of the mature compassion of Christ socially impossible.

Christians are called upon to exercise the creativity of love in this area as well as in others: to provide for the exceptions needed as expressions of mature Christian compassion and stewardship within the context of responsible living. ✤

NOTES

[1]Ronald J. Sider, *Completely Pro-Life*. Downers Grove, IL: Inter-Varsity Press, 1987, pp. 39, 40.
[2]George Grant. *Technology & Justice*. Notre Dame, IN: University of Notre Dame Press, 1986, p. 104.
[3]This tension is analogous to the tension caused by the biblical teaching that we should overcome evil with good while we love our enemies, and at the same time that Christians should be defenders of the poor and helpless.
[4]R. F. R. Gardner. *Abortion, the Personal Dilemma*. Grand Rapids, MI: William B. Eerdmans, 1972.
[5]R. N. Wennberg. *Life in the Balance: Exploring the Abortion Controversy*. Grand Rapids, MI: William B. Eerdmans, 1985.
[6]E. Schaeffer, "Till Death Do Us Part," *Christianity Today*, 4:31, 1987, p. 20.
[7]R. H. Bube. "Crises of Conscience for Christians in Science." *Perspectives on Science and Christian Faith* 41, 1989, p. 11.
[8]W. Gaylin. "Harvesting the Dead," in *Bioethics*, T. A. Shannon, ed. Mahwah, NJ: Paulist Press, 1987, p. 553.
[9]R. Friedman. "Miracle Babies," *The Stanford Magazine*. Winter 1988, p. 47.
[10]E. W. D. Young. "Where is Health Care Heading? The Answers Can Be a Bit Unsettling," Physician's Notebook, *Peninsula Times Tribune*, December 27, 1988.
[11]D. Callahan. *Setting Limits*. New York, NY: Simon and Schuster, 1987.
[12]N. Daniels. *Am I My Parents' Keeper?* New York, NY: Oxford University Press, 1988.

First, those who claim the right to dissent should assume the right to debate.
Second, those who claim the right to criticize should assume the responsibility to comprehend.
Third, those who claim the right to influence should accept the responsibility not to inflame.
Fourth, those who claim the right to participate should accept the responsibility to persuade.

—The Williamsburg Charter

Communications

A Sociologist Looks At Oppression and Shalom

The Lord said to Moses, Say to Aaron and his sons, Thus you shall bless the people of Israel; you shall say to them, The Lord bless you and keep you:

The Lord make his face to shine upon you, and be gracious to you: The Lord lift up his countenance upon you, and give you peace [shalom]. So shall they put my name upon the people of Israel, and I will bless them (Numbers 6:22-27).

Here the blessing of God is the grace of God resting upon his obedient people granting them shalom. Shalom is a rich word meaning more than peace; it carries a sense of wholeness, completeness, harmony. Shalom is total sense of well being for not only individuals but also for a community, a people walking with God together. The blessing of shalom carries a sense of well being in all of life—materially, socially, and spiritually. The people blessed with shalom experienced joy in life.

It is rather obvious why a true prophet of God would preach and promote shalom. But the false prophet also proclaimed shalom according to Jeremiah. Jeremiah 6:14 and 8:11 state: "They have healed the wound of my people lightly, saying, 'Peace, peace,' when there is no peace. Or 'shalom, shalom,' when there is no shalom."

If there was no peace, no shalom, what was there? Again and again the prophet thundered that there was religious idolatry and social oppression. Social oppression was often a consequence of religious idolatry.

In Jeremiah 6:13 and 8:10 we hear oppression described: "Because from the least to the greatest everyone is greedy for unjust gain; from prophet to priest everyone deals falsely."

Or Jeremiah 5:26-28: "For wicked men are found among my people ... Therefore they have become great and rich, they have grown fat and sleek. They know no bounds in deeds of wickedness; they judge not with justice the cause of the fatherless, to make it prosper, and they do not defend the rights of the needy."

In talking about Jerusalem, the key city in Israel, Jeremiah (6:6) declares: "This is the city which must be punished; there is nothing but oppression within her." Jeremiah 7:6 calls on Israel not to "Oppress the alien, the fatherless or the widow..." Or Jeremiah 9:6: "Heaping oppression upon oppression, and deceit upon deceit, they refuse to know me, says the Lord."

Oppression, then, is the opposite of shalom and the absence of justice. Oppression and shalom are polar opposites. Oppression occurs when people in power and authority, usually in social institutions, misuse that power and authority cruelly and unjustly, to crush, humiliate, animalize, impoverish, enslave, and kill persons created in the image of God.

In contrast, shalom occurs when a community, a people of God, are walking in covenant with God and fellow human beings according to the standards of justice and righteousness. Oppression crushes people; shalom releases the crushed ones. Oppression humiliates persons; shalom affirms persons. Oppression animalizes people; shalom humanizes people. Oppression impoverishes people; shalom prospers (necessities of life) people. Oppression enslaves persons; shalom liberates persons. Oppression kills; only justice beyond this life can provide shalom for these persons.

Until recently (the 1980s) there was relatively little scholarly analysis of the biblical concept of oppression, especially in English and written by evangelicals. Until the 1980s there was very little of substance on oppression in standard Bible dictionaries and encyclopedias. The only thorough article on oppression is found in the revised (1986) *International Standard Bible Encyclopedia*, with a total of 222 lines; the 1929 edition of *ISBE* had a brief article of 30 lines. The 1986 *ISBE* article on oppression draws heavily from research done by Thomas Hanks and Elsa Tamez. The norm, however, is no listing of oppression, as in *The Illustrated Bible Dictionary* (1980) published by InterVarsity Press; this dictionary lists Ophrah, Oracle, Orchard and Ordination but not oppression, in spite of the fact that

there are approximately 128 occurrences of the word oppression in the NIV translation.

A question. Why this lack of scholarly research on the concept of oppression? Have our theologians come primarily from the middle and upper classes? Do they lack exposure to, sensitivity to, the experience of oppression? Strangely, awareness of oppression has been forced upon evangelicals by black theologians and liberation theologians. Even now I sense a lack of biblical knowledge and interest in oppression by most white North American evangelicals.

In 1983 Thomas Hanks, a North American evangelical teaching at the Latin American Biblical Seminary in Costa Rica, published *God So Loved The World: The Biblical Vocabulary of Oppression.* In 1982 the English translation of Elsa Tamez's *Bible of the Oppressed* appeared. Tamez is an evangelical colleague of Hanks. We should be grateful for these high quality analyses of the biblical concept of oppression.

Tamez states that "there is an almost complete absence of the theme of oppression in European and North American biblical theology."[1] Hanks asserts:

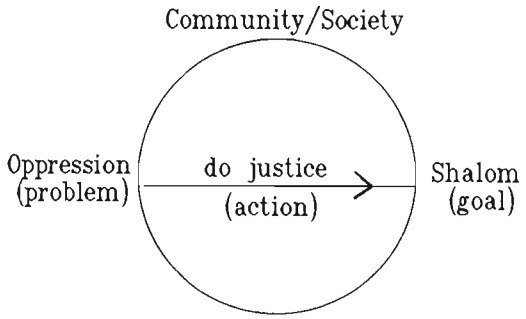
> Anyone who has read much in the theological classics (Augustine, Luther, Calvin, Barth, Beckouwer et al.) will recognize that the theme of oppression has received little or no attention there. One might think that the Bible says little about oppression. Furthermore, one searches in vain for the theme in Bible dictionaries, encyclopedias, and the like.
>
> However, when we strike the rock of a complete Bible concordance, to our great surprise we hit a gusher of texts and terms that deal with oppression! In short, we find a *basic structural category of biblical theology.*[2]

After a thorough study of the Hebrew roots for oppression, Hanks concludes:

> *Oppression is a fundamental structural category of biblical theology,* as is evidenced by the large number of Hebrew roots denoting it (10 basic roots; 20 in all); the frequency of their occurrence (555 times); the basic theological character of many texts that speak of it (Gen. 15; Exod. 1-5; Ps. 72, 103, 146; Isa. 8-9, 42, 53, 58, etc.); and the significance of oppression in Israel's great creedal confession (Deut. 26:5-9).[3]

In my judgment, unless a Christian has a profound understanding of the horror of oppression, a Christian is unlikely to develop a passionate concern for social justice. By and large, the church has not had a biblical understanding of oppression; by and large, the church has done little to execute justice on behalf of the fatherless, the alien and the widow. Some charity, yes, but little fundamental social justice.

One moves from oppression to shalom through justice. See the following diagram:



Perry Yoder, an Old Testament scholar and author of *Shalom,* says the major thesis of his book is that shalom "is squarely against injustice and oppression. Indeed, we shall argue that shalom demands a transforming of unjust social and economic orders."[4] In order to achieve shalom we must "do justice," "execute justice," "pursue justice," "give justice." Justice must be active and aggressive. Note Psalm 82:3-4: "Give justice to the weak and fatherless; maintain the rights of the afflicted and the destitute, Rescue the weak and the needy; deliver them from the hand of the wicked." Yoder adds that *"God's justice sets things right, it is a liberating justice."*[5]

According to Christopher Wright, an Old Testament scholar and author of *An Eye for An Eye,* a major theme in the Old Testament is that God is a God of justice and righteousness. Righteousness is an objective standard or a norm for a society—right relationships in a community bring shalom. Mishpat (justice) is the process and result of fair and just judgments. "Mishpat is what needs to be done in a situation if people and circumstances are to be restored to conformity with righteousness."[6]

In conclusion then, the Old Testament reveals a God who is against oppression, for shalom, and who calls for doing justice in order to achieve righteousness, a fundamental characteristic of a shalom society.

Luke 4:18 and Romans 14:17 indicate that the New Testament is also concerned about oppression, desires shalom and seeks justice. In a Galilean

synagogue in Nazareth, Jesus read from Isaiah: "The Spirit of the Lord is upon me, because he has anointed me to preach good news to the poor ... to set at liberty those who are oppressed, to proclaim the acceptable year of the Lord."

This is a quotation from Isaiah 61, except for the phrase "to set at liberty those who are oppressed", which is from Isaiah 58:6. Isaiah 58 calls upon the followers of God to cease oppression and to do justice. Luke 4:18 ties the Old Testament emphasis on oppression with the New Testament. At the time of Christ the typical Jew suffered from double oppression—from both the Romans and the Jewish religio–politico–economic leaders who corruptly ran the key social institution, the temple. Some of the Galileans listening to Jesus read from Isaiah may well have lost their own land to this double oppression. No wonder "all spoke well of him" (4:22) because Jesus indicated an interest in their poverty and oppression and hinted that following the Jubilee principles of grace and justice might be the way of escape (4:19).

Also the gospel of Luke is well known for its many references to the rich and the poor. These must be interpreted in the light of the Old Testament concept of oppression. So also the cleansing of the temple (Luke 19:45-48). The temple as it was being run represented a system of oppression much like what we find described in Amos, Isaiah and Jeremiah. Jesus, acting as a prophet, opposed oppression and called for justice.

Romans 14:17 indicates that the kingdom of God has a present/social dimension as well as a future/spiritual dimension. The RSV translates 14:17: "For the kingdom of God [is] ... righteousness and peace and joy in the Holy Spirit." The New English Bible uses "justice" in place of "righteousness." If one realizes that Paul, an expert on the Old Testament, would probably have thought in Hebrew "justice and shalom," then one could paraphrase 14:17 "For the kingdom of God is ... justice, shalom and joy in the Holy Spirit."

Now the present/social dimension becomes clear. The kingdom of God in the New Testament is against oppression and for justice and shalom. One could summarize Luke 4:18, 19 and Romans 14:17 as follows:

Stop oppression → do justice → experience shalom → celebrate joy—all in the power of the Holy Spirit.

The gospel of Jesus Christ deals with both personal sin and personal salvation. In addition it covers social oppression and social justice.

With the above articles in mind—oppression, justice and shalom—then Acts 8:12 and 28:23 and 31 make more sense. Acts 8:12 refers to Philip preaching in Samaria: "But when they believed Philip as he preached good news about the kingdom of God and the name of Jesus Christ. ... "

Acts 28:23 and 31 refer to Paul in Rome; in verse 23 the audience is Jewish, and in verse 28 the listeners are Gentiles: "testifying to the kingdom of God and trying to convince them about Jesus both from the law of Moses and from the prophets ... preaching the kingdom of God and teaching about the Lord Jesus Christ."

The kingdom of God is good news both here on earth and later in heaven. "Thy kingdom come, thy will be done, *on earth* as it is in heaven" (Matthew 6:10). And that kingdom on earth is justice, shalom and joy in the Holy Spirit!

How should the church of today oppose oppression and do justice in order for people to experience shalom?

In the 1989 fall semester I taught a Racial and Cultural Minorities course. After I gave the class vigorous exposure to the nature of ethnocentrism/racism, I asked them to write two essays: one was how society could improve race relations and the other essay was how the church should improve race relations. Two of my students were black; neither of them would be classified as radical militants. Both of them, however, used stronger words such as "a war against racism" or "we need a revolution (non-violent)," than did the white students, some of whom were profoundly concerned about ethnocentrism/racism.

I have noticed the same phenomenon as I have read the literature written by black and white authors. The typical white author will talk about reform, piecemeal social reform. A black author is more apt to use more radical words such as revolution. For example, John Perkins, a non-violent evangelical black who specializes in evangelism and Christian community development, entitled one of his books *A Quiet Revolution*.[7] Perkins' strategy is to rebuild poor black communities with new medical, housing and legal social institutions under the control of black leadership but with the assistance of interested whites. Martin Luther King said that for years he labored "with the idea of reforming existing institutions of the South, a little change

here, and a little change there." Finally, towards the end of his ministry, King concluded, "I think you've got to have a reconstruction of the entire society, a revolution of values."[8]

In modern terminology scriptural social justice would include charity, social reform, and social transformation (or revolution). All three components are needed. The modern evangelical church excels at charity, occasionally engages in specific social reform and rarely attempts social transformation; i.e., *a reconstruction of the entire society, a revolution of values.*

The understanding and practice of charity is widespread so we need not elaborate on this aspect of social justice. Social reform occurs when one attacks a specific problem such as the lack of quality low income housing without necessarily addressing the values and social structures which create poverty and homelessness. Habitat for Humanity is an excellent example of a social reform ministry. It builds low income housing and sells the houses to the poor at no interest, thus enabling the poor to own their homes.

The issue of slavery is instructive in pointing out the need for something more than social reform. Lincoln freed the slaves, a bold and dramatic social reform. Before the century was out, however, most southern blacks were back in a semi-slavery status through rigid social segregation and an economic system of sharecropping. The underlying values which supported slavery, racism, and greed, had not been changed so they soon spawned new forms of oppression. The 1960s civil rights movement achieved some additional reforms such as voting rights, but again the underlying values of racism and greed were not challenged and changed in any fundamental way. Therefore, in the 1980s we experienced resurgent racism and legitimated greed implemented through our existing social institutions.

Bread for the World, a Christian lobbying organization located in Washington, D.C., attempts to influence lawmakers to pass legislation to help the poor and oppressed of the world. A Christian voice for justice in the center of governmental power, Bread for the World has had some success in changing societal values and practices.

In the Old Testament, the leaders of society (i.e., rulers, kings, judges and priests) were addressed by the prophets as they opposed oppression and called for justice so that the people could experience shalom. Though not as fully recognized by evangelicals, one of Jesus' ministries was to function as a prophet in his day. Jesus opposed the oppression of the poor, cleansed the temple, and called for the Jewish religio–politico–economic leaders to repent, to change their ways.

In new and creative ways under the leadership of the Holy Spirit the church of Jesus Christ must find more comprehensive methods to do justice. May the sleeping giant awaken and proclaim and practice the full kingdom of God on earth! ✤

NOTES

[1]Tamez, Elsa. *Bible of the Oppressed*. Maryknoll, NY: Orbis Books, 1982, p. 4.
[2]Hanks, Thomas. *God So Loved the Third World: The Biblical Vocabulary of Oppression*. Maryknoll, NY: Orbis Books, 1983, p. 4.
[3]Ibid., p. 38.
[4]Yoder, Perry. *Shalom: The Bible's Word for Salvation, Justice, and Peace*. Newton, KS: Faith and Life Press, 1987, p. 5.
[5]Ibid.
[6]Wright, Christopher. *An Eye for An Eye: The Place of Old Testament Ethics Today*. Downers Grove, IL: InterVarsity Press, 1983, p. 134.
[7]Perkins, John. *A Quiet Revolution*. Waco, TX: Word, 1976.
[8]Oates, Stephen. *Let the Trumpet Sound: The Life of Martin Luther King, Jr.* New York: New American Library, 1982, pp. 441-2.

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Dialogue

A Christian Perspective on Time

I was pleasantly surprised to read the review (March 1990) of S. W. Hawking's book, *A Brief History of Time*. The Christian view of science is usually presented in terms of creation versus evolution and leaves the impression that this is the only topic of importance to us. Physics is fascinating too, and there are plenty of scriptural issues raised by nuclear theory, quantum mechanics, and Special and General Relativity. All of these theories, I believe, suffer from a flawed view of time, and so I would like to say a bit more on that topic.

When God created the universe, he needed a way of depicting "separateness." He apparently created space and time to meet this requirement. Space and time are thus *not* a "connecting medium" as modern physics depicts them. Instead, they represent discontinuities. Objects or events are *separated* (not connected) by space and time.

Both space and time apparently progress. We are familiar with the progression of time but space itself apparently expands or progresses also. This would explain why redshifts predominate in our universe, and why the redshifts increase with distance. Perhaps this is also why the Bible uses the term "stretching out the heavens" so many times. (Isaiah 40:22, 42:5, 44:24, 45:12, 48:13, 51:13, Jeremiah 10:12, 51:15, Psalm 104:2, Job 26:7, 9:8, 37:18, Zechariah 12:1)

If space progresses, we may ask, does space progress with respect to time? Is the ratio a constant? The appearance of the speed **c** in fundamental equations like $\mathbf{E=mc^2}$ and **E=cB** implies that there is such a thing as a physical space/time ratio and that it progresses at a fixed rate. This "progressive space-time" is "physical" in the sense that matter and energy are physical (the equations must balance dimensionally); it is not the same as reference-frame space and time.

This natural association of space/time units would represent the "nothing" datum for the *physical* universe. Departures from this speed would then be "not-nothings." The Rydberg fundamental frequency, for instance, would represent a class of entities known as photons.

Time is scalar in these equations, but the constancy of the speed of light, as well as the separability aspect, imply that time must also have the property of "dimensionality" like space.

Picture two photons moving directly away from each other. The photons move through coordinate time as well as through coordinate space. When the total space traversed by the two photons is divided by the true magnitude of the total coordinate time traversed, the ratio will always be a constant. In this case, the separation rate would be computed as c, rather than 2c. This would explain the results of the Michelson-Morley experiment, as well as DeSitter's problem and Bradley's stellar aberration.

The temporal and spatial aspects of photon motion are not adequately depicted by the conventional reference system. If two photons originate in the same event (as in electron-positron annihilation), they would remain within the same *time* unit even though they become spatially separated. They are thus "together" in the temporal sense, though "separate" in the spatial sense. From a conventional standpoint, this situation will lead directly to the classical EPR paradox with its seeming problems of action-at-a-distance and existence-because-of-measurement.[1]

Speeds in coordinate time would have no velocity or positional component in a spatial reference system. If entities in such a temporal system were to enter our spatial system, they would appear to pop in anywhere (even miles underground) and fly off in random directions. Cosmic rays are particles that have this "homogeneous and isotropic" property. The non-localized microwave "background radiation" the astronomers detect is a candidate too, except that high energy photons would also have to be part of the background.

Phenomena in physics that show causality, but not determinacy, may also involve spatial/temporal (or vector/scalar) transformations. Suppose a

photon strikes an atom and is absorbed by it. The atom can retain the energy for a period of time and then emit photon(s) equivalent to the original energy and in direction(s) that appear random. The first event *causes*, but does not *determine* the second event. In this example, some information (the direction of the original photon) seems to get lost. Other information (the time delay and the direction of the subsequent photon) seems to originate out of nowhere. There are many situations like this in physics and they are very hard to explain in terms of actual, microphysical mechanisms. If an engineer had to design and build an atom to do this kind of thing, he would have a very tough time even coming up with a workable conceptual scheme!

Physicists generally have not been enlightened by scriptural reasoning and frequently draw conclusions that would be hard for a Christian to accept. Quantum theory, for instance, presents this picture of reality:

> The physicist thus finds himself in a world from which the bottom has dropped clean out; as he penetrates deeper and deeper it eludes him and fades away by the highly unsportsmanlike device of just becoming meaningless. No refinement of measurement will avail to carry him beyond the portals of this shadowy domain which he cannot even mention without logical inconsistency. A bound is thus forever set to the curiosity of the physicist. ... The world is not a world of reason, understandable by the intellect of man, but as we penetrate ever deeper, the very law of cause and effect ... ceases to have meaning. The world is not intrinsically reasonable or understandable; it acquires these properties in ever-increasing degree as we ascend from the realm of the very little to the realm of everyday things; here we may eventually hope for an understanding sufficiently good for all practical purposes, but no more. (*Reflections of a Physicist*, P.W. Bridgman, 1955, pp. 185-186)

> When we thought we were studying an external world our data were simply our observations; the world was an inference from them. Until this century it was possible to make such an inference intelligibly. ... But now we find that ... we can no longer express them as the structure of an external world unless we accept a world which is arbitrary, irrational and largely unknowable. (*The Scientific Adventure*, Herbert Dingle, 1953, p. 261)

> The "real" world is not only unknown and unknowable, but inconceivable—that is to say, contradictory or absurd. (*A Century of Science*, Herbert Dingle, 1951, p. 315)

> Insistence on the postulate of complete logical clarification would make science impossible. (*Physics and Philosophy*, Werner Heisenberg, 1958, p. 86)

> We have to admit that our conception of material reality today is more wavering and uncertain than it has been for a long time. ... To construct a clear, easily comprehensible picture on which all physicists would agree—that is simply impossible. Physics stands at a grave crisis of ideas. ... We hope that the present fluctuations of thinking are only indications of an upheaval of old beliefs which in the end will lead to something better than the mess of formulas which today surrounds our subject. ("What Is Matter?", Erwin Schrodinger, *Scientific American*, Sept. 1953, pp. 52ff.)

Is this the kind of universe God would make for us? Our God is a God of "lovingkindness, justice and righteousness. ... His work is perfect, for all His ways are just; a God of faithfulness and without injustice, righteous and upright is He. ... God is light, and in Him there is no darkness at all" (Jeremiah 9:23-24, Deuteronomy 32:4, 1 John 1:5 *NASB*). Would this God of love create us in His image and then put us into a nightmare universe that is "highly unsportsmanlike" and "arbitrary, irrational and largely unknowable" (1 John 4:16, Genesis 1:26)?

It does not matter to God whether the things of creation are very small or very large, for "nothing in all creation is hidden from God's sight. Everything is uncovered and laid bare before [his] eyes" (Hebrews 4:13, *NIV*). His values are consistently expressed in all that He does, for He is "the Father of all lights, with whom there is never the slightest variation or shadow of inconsistency" (James 1:17, *Phillips*). These statements lead us to believe that the physical universe is entirely rational and understandable from the human standpoint. We would apparently even be intuitively comfortable with the unanalyzable portions of it, though this is not the situation in physics today.

The Bible does not leave us wondering about the properties of God's physical creation. It comments on such matters explicitly: "The heavens are telling of the glory of God; and their expanse is declaring the work of His hands. Day to day pours forth speech, and night to night reveals knowledge. There is no speech, nor are there words; Their voice is not heard. ... How many are your works, O Lord! In wisdom you made them all" (Psalm 19:1-3, *NASB*, 104:24, *NIV*). The study of God's works is highly appropriate: "Great are the works of the Lord; They are studied by all who delight in them" (Psalm 111:2). "He seals the hand of every man, that all men may know His work. ... Stand and consider the wonders of God. Do you know how God establishes them?" (Job 37:7,14-15).

It is to Job in particular that God asks questions about His physical creation: "Do you know the ordinances of the heavens? ... Where is the way that the light is divided? ... Where is the way to the dwelling of light?" (Job 38:33,24,19). These must be "fair" questions. That is, they must have answers that would be understandable to us. This is especially so since God describes himself as the God of

Light. If light could prove to be "contradictory or absurd," God would surely have used a different metaphor!

Moreover, God reveals these things even to unbelievers, and not as an afterthought, but on purpose: "What may be known about God is plain to them, because *God has made it plain* to them. For since the creation of the world God's invisible qualities—his eternal power and divine nature—have been clearly seen, being understood from what has been made, so that men are without excuse" (Romans 1:19-20, *NIV*).

Modern theoretical physics seems to want to change that clear picture. In the physics of this century we are told that space is curved and time is warped. In nature itself "everything is relative" (without absolute magnitudes, properties, etc.). We are told that common sense must be discarded, rules of ordinary logic don't work, uncertainty is elevated to a Principle, and proofs are done by paradox method. On closer examination we frequently find "facts" that turn out to be theories. We find instances of proof-of-theory turning out to be proof-of-postulate (the starting point of the theory, not the end point). We find validation of mathematics being construed as proof of conceptual interpretation. We even find facts being corrected to fit the theory instead of the theory being corrected to fit the facts. One is left with the impression that Christians aren't the only ones who may be "carried away by varied and strange teachings" (Hebrews 13:9).

Christians have lots of experience in dealing with very difficult problems. They have to watch out "for false Christs and false prophets [who] will arise and will show great signs and wonders, so as to mislead" (Matthew 24:24, 4-5, 7:15-27). They have to watch out for the "empty deception according to the tradition of men" (Colossians 2:8, Matthew 23:1-36) as well as that of Satan "who deceives the whole world" through his various constructs (Revelation 12:9, 13:14, 18:23, 2 Thessalonians 2:1-12). Paul shows that these are real problems affecting actual people (1 Timothy 4:1-6, 2 Timothy 3:13).

Christianity was imbued with methods to deal with these problems. Christians knew that "the naive believes everything. But the prudent man considers his steps" (Proverbs 14:15). They were to "test the spirits to see whether they are from God" (1 John 4:1-3). Paul was "explaining and proving" from the scriptures and the Bereans were "examining the scriptures daily to see whether these things were so" (Acts 17:1-3,11, *NIV*, *NASB*). They had rules of evidence governed by Hebrews 11:1 and were to "be putting yourselves to the test for the purpose of ... finding that you meet the specifications" (2 Corinthians 13:5, *Wuest*). Their problem-solving methods produced "mature men with minds trained by practice to distinguish between good and bad" (Hebrews 5:14, *JB*).

Could we use these same methods today, in this age of science, to produce explanations for puzzling phenomena encountered in physics and astronomy? Could we produce a physics that is concordant with the values in the Bible?

The Bible seems to answer this question in a comprehensive way: "His divine power has granted to us everything pertaining to life and godliness" (2 Peter 1:3). The scriptures were given "so that the man who serves God may be fully qualified and equipped to do every kind of good work" (2 Timothy 3:16-17, *TEV*). The Bible intimately connects the "fear of the Lord" with "the beginning of wisdom" and understanding (Proverbs 1:7, 29-33, 9:10, Psalm 111:10); hence, "those who seek the Lord understand all things" (Proverbs 28:5). Jesus said his Father would send the Holy Spirit and "He will teach you all things" (John 14:26). "The anointing you received from [God] abides in you, and you have no need for anyone to teach you; but ... His anointing teaches you about all things, and is true and is not a lie" (1 John 2:27). We are enabled to "walk as children of light for the fruit of the light consists in all goodness and righteousness and truth" (Ephesians 5:8-9).

It seems clear that such a "scriptural physics" can be constructed and that it can offer us new insights and plausible alternatives to the difficult factual, theoretical, and scriptural problems embodied in the physics of this century. Christians need these insights because "our battle is to break down every deceptive argument and every imposing defence that men erect against the true knowledge of God" (2 Corinthians 10:4-5, *Phillips*). We are the light of the world and it is appropriate that we should share our light on this topic too (Matthew 5:14-16).

Notes

[1] A good technical overview of the EPR paradox is given in the article "The Quantum Theory and Reality" by Bernard d'-Espagnat in *Scientific American*, November 1979, pp. 158ff.

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Some Problems With Fischer's "Days of Creation"

I was disappointed by the way Dick Fischer, "The Days of Creation" (*PSCF*, March 1990) handled the biblical passages. For example, he disregarded the quoted comment that 'day' with a numeral means a solar day (p. 16). I expect an evangelical scholar to hold that scriptural usage is vitally important, not something to be sloughed off or ignored. This is not a matter of a grammatical rule (p. 17). The claim seems to me to be a red herring. A grammatical rule is syntactic, whereas this is a matter of consistent semantic usage. On this point, Ryrie is certainly correct. Further, Fischer's comment extends through the rest of the Old Testament, so far as I have been able to determine. There are numerous passages that note the day of the month. There are others, like Leviticus 8:35 and 9:1, that specify a number of days and the day following the sequence—or one of the days in the sequence (cf. Deuteronomy 16:4). The sole restriction I can find is the coupling of 'day' (Strong's 3117) with 'night' (3915), as in the forty days and forty nights of the flood (Genesis 7:4, 12), of Moses' stay on Sinai (Exodus 24:18; 34:28; Deuteronomy 9:9, 11, 18, 25; 10:10), and of Elijah's miraculous sustenance (I Kings 19:8). Related usages are found in I Samuel 30:12; Job 2:13; Jonah 1:17. In these passages, the reference of 'day' is to the daylight hours rather than to the sunset to sunset Hebrew period.

But if, despite the consistent usage of *yom* with a numeral to specify either a 24-hour period or its daylight portion, we allow that the word may mean an indefinite period, we find ourselves involved in more serious difficulties. The term's specific coupling to *ereb*, 'evening' (6153), and *boquer*, 'morning' (1242), in each reference with a numeral in the creation passage (Genesis 1:5, 8, 13, 19, 23, 31) creates grave difficulties. Whatever can be the evening or dusk of an eon that is followed by its morning or dawn? What warrant can be found to make sunset and sunrise geological periods or epochs? Obviously none. So Fischer makes it "God's timing" (p. 18; cf. p. 15). But this leads to incoherence.

We are told that the first chapters of Genesis must speak of eons because of Psalm 90:4 and 2 Peter 3:8—along with the "of old" of 2 Peter 3:5 (p. 20). But how long must we wait for something to be from antiquity? United States tariff regulations in 1966 were amended to make any object a century old an antique. The Egyptian pyramids, antedating both Moses and Abraham, certainly qualify. So the universe, whether it antedates Adam by days or gigayears, may be said to be "of old." For the rest, do not the verses quoted rather indicate the timelessness of God by referring to the largest time readily formulatable and the smallest obvious division? Until recently, the largest named unit of time was the millennium, despite the larger number, myriad, used by Archimedes in his unique computations. The smallest clearly demarcated unit was the day. I suspect that, if the passage were written today, it would probably refer to gigayears and attoseconds—provided the multipliers were commonly understood. There are the prefixes 'tera', 'peta' and 'exa', but they would take us back before the Big Bang, which is the probable commencement of time.

Applying this philosophical and theological insight that God is timeless, what is "a day of God's time" (p. 15)? Since this is a nonsense question, Fischer's day-age interpretation must also be nonsense. The only way out of this conclusion that I know of is to make the deity limited, within the universe. But this is pantheistic or panentheistic, not theistic. Although probably totally unintended, what Fischer says of God's omnipresence (p. 18) can also be fit into these non-theistic views. He has God everywhere at once, whereas the orthodox interpretation has God outside of or independent of place, as He is independent of time and matter. Only thus can He be truly the Creator, the source of all things rather than a part of the universe.

Fischer tries to deal with another aspect of the general problem on pp. 18ff. Arguing in defense of a fourth day sun, he clearly adopts a terrestrial view—which seems to be generally appropriate throughout the narrative. But then he switches to an astronaut's view from low earth orbit to try to twist his way out of the problem. This cannot be passed off as God's viewpoint, for, as non-spatial, He does not have a point from which to view. Fischer passes over the impossibility of such a view making sense to anyone until, at the very least, the Copernican view became current. So far as I have been able to discover, apart from the views of the Pythagoreans and Aristotle, later followed by Eratosthenes, the consistent ancient view was that the habitable earth is flat—unless it is saucer-shaped, the Egyptian view. For these ancients, sunrise and sunset occur at the same time for all. Only the rate of the sun's movement toward or from the

zenith would vary with east-west position. Thus the morning would theoretically be shorter and the afternoon longer at Babylon than at Thebes. A consequence of Fischer's view is that God chose language that necessarily confused and misled everyone studying the Word until the modern period was reached. As a matter of fact, not till the astronauts' reports would the interpretation Fischer advocates be likely to occur to anyone. Is this consequence consistent with the character of God?

There is a further problem with this interpretation, popular though it be. In the same issue of the journal, John R. Armstrong noted Buckland's 1837 objection that the "order of appearance in the strata did not match the order in Genesis 1" (p. 36). This difficulty cannot be met by explaining how there could be days before the appearance of the sun (p. 17). What is needed is an explanation of how there can be seed-bearing herbs and trees (polycots, Permian, 250 million years before the present; dicots, Jurassic, 200 m.y.b.p.—dates are rounded off very roughly) and grasses (monocots, Cretaceous, 100 m.y.b.p.) before fishes (Cambrian, 550 m.y.b.p., or Ordovician, 450 m.y.b.p.); and birds (Jurassic, 150 m.y.b.p.) before "creeping things" (amphibia, Devonian, 400 m.y.b.p.; reptiles, Carboniferous, 325 m.y.b.p.). Adding the insects (Carboniferous, 300 m.y.b.p) as "flying things" (p. 15) and creepers (cf. Leviticus 11:20-46, where words from two roots are intermingled—Strong's 7430f, 8317f; Genesis 1:24-26, 30, uses the former) does not help sort things out. Can the Author of Scripture be that confused, not knowing what the Source of terrestrial life did?

Does the interpretation of *yom* in Genesis 1 as strictly solar days contradict Genesis 2:4 (pp. 16f)? Only if the latter is part of the seven-day report. If it is part of a new revelation, a different view of the work of the Creator, there is no problem. That it is thus to be understood follows from the impossibility of fitting the events of Genesis 2:15-24 into the sixth day, as Fischer notes (pp. 19f). He is right that Genesis 2 is a problem for those who argue for a creation begun and finished within 144 hours. But that does not necessarily bolster his view. An elementary truism in logic is that demolishing view A does not prove view B unless it has been previously demonstrated that A and B jointly exhaust the possibilities. Dallas Cain's presentations in numerous annual meetings, which note a score of alternates, warn us against such oversimplification.

Fischer also argues his age-day theory on the basis of the seventh day extending down through the church age (p. 20). How does this perpetual divine rest fit with Christian theism? It sounds like deism. How does it fit with the words of our Lord, "My Father worketh hitherto, and I work" (John 5:17)? The original may be translated, "My Father down to the present moment is working continually, and I am working." Paul declares that the believing "are his workmanship, created in Christ Jesus unto good works" (Ephesians 2:10; cf. 4:24; Colossians 3:10, etc). But Fischer's God is resting.

Does Hebrews 4:1, 3, demonstrate that God is resting in the church age (p. 20)? In Deuteronomy 3:20, the Lord gives rest in the Promised Land (cf. 12:9; Joshua 1:13, 15; 21:44; 22:4; 23:1). This is specified by God as "my rest" (Psalm 95:11). This last is quoted in Hebrews 3:11 (cf. v. 18), leading up to the passage Fischer cites. So what the passage declares is that the rest of Genesis 2:2ff and of the Promised Land (and probably even Christ's gift of rest [Matthew 11:28-30], which we already enjoy) foreshadow a perfect rest.

I do not believe that Fischer is unorthodox at heart. He simply exemplifies the common human failing of seeing another's problem clearly without seeing that he, too, has a problem. Indeed, it appears to me that he has so singlemindedly pursued his viewpoint that he has inadvertently substituted eisegesis for exegesis. He has correctly seen that the view that attempts to compress the entire history of creation into 144 hours produces conflicts with other scriptural passages and with science. He has failed to see that his day-age interpretation does the same, but with different passages and different areas of science. The opponents he recognizes usually perceive the alternatives as their 144-hour view and atheistic evolutionism (p. 21). Fischer correctly sees that there is a third view. But here he gives no evidence of recognizing the wider range of positions advanced by serious Christians. I am convinced that he, and I, and the rest of the family of God, need a concerted effort to distinguish between what we have been told the Bible says and what it says, between bad philosophy mistakenly touted as good theology or good science and the full scope of good philosophy, good theology and good science. May God grant us wisdom and understanding. ✤

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Fischer Responds to Dr. David Siemens

I too would be disappointed, notwithstanding amazed, if everyone agreed with me. At the very least this constructive criticism serves to demonstrate that I did not have a napping audience. In Dr. Siemens' remarks, he has raised some valid issues, and I wish to express my appreciation for the depth and clarity with which he stated his case. To quote the late Francis Schaeffer from his book *Genesis in Time and Space*, "A Christian holding the strongest possible view of inspiration still does not claim exhaustive knowledge at any point." To which I would add, Amen. Alas, it is far easier to ascertain what is dead wrong than it is to know what is dead certain, and Creation is not an easy issue. However, let me address some of Dr. Siemens' arguments and objections in the order in which he raised them.

I do hold that "scriptural usage is vitally important," though I would hasten to add that I think the depth of our understanding of certain doctrinal issues such as the shed blood for remission of sin, for example, far outweighs the need for us to understand whether the creation days were 24 hours in duration or simply designated times of undesignated length. However, when some well-known young-earth proponents push the 24-hour day definition to the limit, and thereby advocate the creative week from the Big Bang to Adam's operation must have taken place in six consecutive 24-hour time periods, it only causes the majority of well-educated skeptics to label such proponents as half-witted Bible thumpers. Frankly, many evangelicals who hold to a "literal" interpretation of Scripture, such as I do, don't appreciate being painted with the same brush.

There is another explanation that I believe Dr. Siemens is alluding to, and that is that the days of creation were 24 hours in duration and in proper sequence, but were not necessarily consecutive. As this theory goes, God commanded, "Let there be light," but the implementation following his command could have taken any amount of time. These proponents argue that the "evening" and "morning" only applied to His divine *fiat* or command, not to the entire events which followed. So, the first 24-hour day may have occurred four and a half billion years ago, the second 24-hour day was, oh, a billion years later, with the third 24-hour day two and a half billion years after that, and so on. Separating those six 24-hour periods with at first billions and later millions of years may work for some, but I hope you will excuse me if I fail to see how this explanation fits Scripture any better than does the day-eon version.

First of all it doesn't take 24 hours to say, "Let there be light." Also, just as the sun never set on the British Empire back in the days when "Britannia ruled the waves," likewise the sun never sets on God. Sunset and sunrise are visual phenomena. As I tried to point out with my astronaut illustration, for one to see or experience evening or morning requires that such an observer be in a fixed position on one of the planets which revolve around our sun, in this case Earth.

But God is not fixed in time or space; we can't view the world as He views it. However, if any of us could be observers standing on the bright side of the Moon, à la Neil Armstrong, we could see the small hand on our watch make two revolutions without witnessing a sunrise or a sunset. A 24-hour day definition is truly the "red herring" because it demands a terrestrial observer which does not exist through the first four "days" of creation.

Morning (*boquer*) may have an absolute meaning on God's scale yet only have a symbolic meaning on our scale. Conversely, an early morning sunrise may be an absolute experience to us, yet be only symbolic to God as His sunrise is perpetual, as is His night. Thus Ryrie's 24-hour day definition is not just erroneous, it's superfluous.

As to whether the universe is old or young, well, it's old. That is, if roughly 16 billion years can be thought of as old. As to the conclusion that Dr. Siemens makes that, "the universe, whether it antedates Adam by days or gigayears, may be said to be 'of old,' " I'd really have to take issue. In Genesis 18:11, does it make any difference that Sarah was "old" when Abraham was told they would have a son? The birth of Isaac was a miracle wrought by God simply because of their advanced age. A 45-year-old Sarah might be old to some, but where is the miracle in that?

As to the charge that my view must imply that, "God chose language that necessarily confused and misled everyone studying the Word until the modern period was reached;" these words have much the same ring as those that thundered down

to a man named Galileo who dared to put forth what was then a remarkable claim. In direct contradiction to the "orthodox interpretation," he believed, in fact observed, that the sun only appeared to orbit the Earth. In fact, the earth itself revolved, Galileo proclaimed. Apparently the clergy were persuasive in rebuttal. Of course, imprisonment and having been threatened with torture might have had an impact.

His poignant public recantation should be sobering to us all: "I, Galileo, being in my seventieth year, being a prisoner and on my knees, and before your Eminences, having before my eyes the Holy Gospel, which I touch with my hands, abjure, curse and detest the error and the heresy of the movement of the earth."

Even though the sun still, "rejoiceth as a strong man to run a race," and "his going forth is from the end of the heaven, and his circuit unto the ends of it," (Psalm 19:5-6) still it's the earth revolving on its axis that causes the race. Shall we reopen that issue as well?

Language in Scripture was not chosen to mislead earlier generations, but many passages had diminished meaning until the fullness of time revealed their greater meaning. In Exodus 12:5, did the Israelites of that day realize what the significance was in choosing lambs without blemish? How many years would pass before the true meaning of the blood covering in Exodus 12:7 would be known? How many years was Psalm 22 recited in the synagogues before these words bore home? "They pierce my hands and my feet ... they part my garments among them and cast lots ... " (Psalm 22:16b,18). In fact, the Bible is replete with passages which only give fullness of meaning to future generations.

As to the argument that some members of the animal world appear to predate certain species of the plant world, that should not be a sticking point. The mechanics of plate tectonics and continental drift which have only been understood in recent years bear directly on Buckland's objection that the "order of appearance in the strata did not match the order in Genesis 1." Just as evidence of early marine life can be found on mountaintops today, so too might evidence of early plant life on what was then dry land be found on ocean floors, except that any hope of finding such evidence borders on the impossible for obvious reasons. A further complication of finding evidence is that continental plates override one another such that the ancient surface of one plate may underlie another plate today. If the reference to "winged fowl" in Genesis 1:21 is translated as "winged creature," a possible description of insects, then that objection too is erased.

Dr. Siemens furnishes a valuable lesson in logic, "An elementary truism in logic is that demolishing view A does not prove view B unless it has been previously demonstrated that A and B jointly exhaust the possibilities." I would like to ask what rules of logic apply to this sequence of sentences taken from Dr. Siemens' critique? "Applying this philosophical and theological insight that God is timeless, what is 'a day of God's time?' Since this is a nonsense question, Fischer's day-age interpretation must also be nonsense."

Just how does one author's ability to construct a nonsense question cast aspersions on another author's ability to interpret? Not just interpret, mind you, but to place difficult passages of Scripture into a modern context without violating well-accepted findings of science as some of the other popular interpretations do.

To answer the question directly, I see no discrepancy between God's eternal existence, sometimes understated as "timelessness," and His ability to function in real time. (See Exodus 9:5-6, for example). Dr. Siemens, in his critique, has misapplied the word "timeless" as if it were a constraint.

If Dr. Siemens had difficulty reconciling God at rest in Hebrews 4:1,3 with God at work in John 5:17, his quarrel is with the authors, not with me. Try matching up Ephesians 2:8-9 with James 2:17-18, or Luke 23:43 with Acts 2:31, to cite just two examples. May I just suggest there should be no incongruity with God in His rest from creation on into the New Testament, while hard at work at the task of redemption?

I hope readers of these two articles will appreciate that it is far more difficult to take a stand and attempt to provide cogent answers to some of the most taxing parts of Scripture than it is to take no stand at all and simply hurl questions. I don't have all the answers, nor do I know of any individual who is in possession of all the answers. But that doesn't mean that we shouldn't attempt to eliminate the barriers to understanding which trap so many unbelievers in the world system.

Even if we do fail to interpret every passage with absolute precision, it isn't total understanding that is asked of us. If we can just bring the Bible to the unbeliever with a little more relevance, if we can

just present the gospel with less barriers to comprehension, isn't that a worthy goal? The sin is not in the failing but in the failing to try. May God strengthen our faith in the task and help us to be obedient to His Word. ✣

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Aphorism 89 from Francis Bacon's "The New Organon" or "True Directions Concerning Interpretation of Nature" —1620

"Neither is it to be forgotten that in every age Natural Philosophy (science) has had a troublesome adversary and hard to deal with; namely, superstition, and the blind and immoderate zeal of religion. For we see among the Greeks that those who first proposed to men's then uninitiated ears the natural causes for thunder and storms, were thereupon found guilty of impiety. Nor was much more forbearance shown by some of the ancient fathers of the Christian church to those who on most convincing grounds (such as no one in his senses would now think of contradicting) maintained that the earth was round, and of consequence asserted the existence of the antipodes.

"Moreover as things now are, to discourse of nature is made harder and more perilous by the summaries and systems of the (Scholastics); who having reduced theology into regular order as well as they were able, and fashioned it into the shape of an art (form), ended in incorporating the contentious and thorny philosophy of Aristotle, more than was fit, with the body of religion.

"To the same result, though in a different way, tend the speculations of those who have taken (it) upon them(selves) to deduce the truth of the Christian religion from the principles of philosophers, and to confirm it by their authority; pompously solemnising this union of the sense and faith as a lawful marriage, and entertaining men's minds with a pleasing variety of matter, but all the while disparaging things divine by mingling them with things human. Now in such mixtures of theology with philosophy only the received (Greek) doctrines of philosophy are included; while new ones, albeit changes for the better, are all but expelled and exterminated.

"Lastly, you will find that by the simpleness of certain divines, access to any philosophy, however pure, is well nigh closed.

"Some are weakly afraid lest a deeper search into nature should transgress the permitted limits of sober-mindedness; wrongfully wresting and transferring what is said in holy writ against those who pry into sacred mysteries, to the hidden things of nature, which are barred by no prohibition.

"Others with more subtlety surmise and reflect that if second causes are unknown everything can more readily be referred to the divine hand and rod; a point in which they think religion greatly concerned; which is in fact nothing else but to seek to gratify God with a lie.

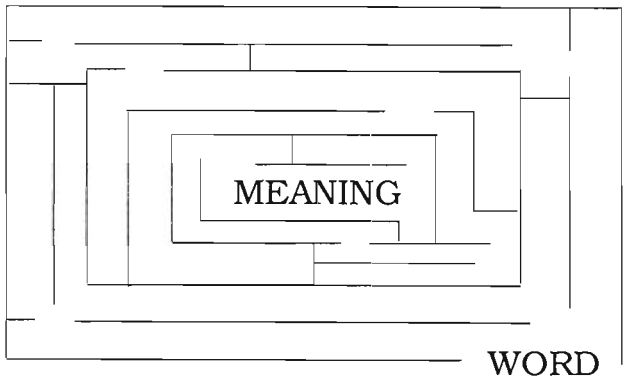
"Others fear from past example that movements and changes in philosophy will end in assaults on religion. And others again appear apprehensive that in the investigation of nature something may be found to subvert or at least shake the authority of religion, especially with the unlearned.

"But these two last fears seem to me to savour utterly of carnal wisdom; as if men in the recesses and secret thoughts of their hearts doubted and distrusted the strength of religion and the empire of faith over the sense, and therefore feared that the investigation of truth in nature might be dangerous to them.

"But if the matter be truly considered, natural philosophy is after the word of God at once the surest medicine against superstition, and the most approved nourishment for faith, and therefore she is rightly given to religion as her most faithful handmaid, since the one displays the will of God, the other His power. For He did not err who said 'Ye err in that ye know not the Scriptures and the power of God', thus coupling and blending in an indissoluble bond of information concerning His will and meditation concerning His power.

"Meanwhile it is not surprising if the growth of Natural Philosophy is checked, when religion, the thing which has most power over men's minds, has by the simpleness and incautious zeal of certain persons been drawn to take part against her."

Penetrating the Word Maze



Taking a look at words we often use—and misuse. Please let us know whether these attempts at clarification are helpful to you.

Today's words are: "creation/evolution."

The dictionary definitions: ***creation:*** *"the act of bringing the world into ordered existence";* ***evolution:*** *a process of continuous change in a certain direction."* [Webster's Ninth New Collegiate Dictionary, Merriam-Webster, Springfield, MA (1987).]

* * * * *

Surely it must be superfluous today to talk about the definition of "creation" or "evolution." Haven't these terms been beaten to death in recent years with all the public debate?

Apparently the answer is no. These terms are consistently misused to advance certain theological or philosophical positions. It would seem somehow incomplete to have a series on the use and misuse of words important to the interaction between science and Christian theology without including them.

The prevalent source of confusion in the use of these two terms involved two failures: (1) the failure to discriminate between the fundamental meaning of Creation as biblically revealed, and one or more particular mechanisms used to describe the activity of creation; and (2) the failure to discriminate between the scientific description of God's probable activity in earth history, and the quasi-religious commitments of Evolutionism.

The importance of Creation as a biblical doctrine cannot be over-emphasized. It drives a sharp wedge between competing world views on God and human beings. It rules out *naturalism, dualism,* and *pantheism.* It shows us that we depend moment-by-moment for our very existence upon the continuing free activity of God. It sets forth both the transcendence and immanence of God. While not solving the implacable riddle of evil, it reveals that evil is not intrinsic to the created universe, but that evil and sin are aberrations on that good creation.

But the significance of the biblical doctrine of Creation does not depend on the method or mechanistic details of God's actual creative activity. The Bible tells us *that God created;* the answer to questions as to *how* God created must be sought also in the revelation God has given in the universe He has made.

There is ample evidence that living creatures undergo changes in biological structures in response to environmental changes, and it is this fundamental observation that forms the foundation for the description of life origins and changes known as evolution. It is supported by a growing body of understanding at the biochemical level. As with every major scientific theory, many unanswered questions still exist.

But one question can be readily answered: "If the biological theory of evolution were indeed a

relatively accurate description of what happened historically, what would be its implication for the Christian?" The answer is simply this: "Then this would provide us with information about the way to describe God's actual mechanisms and modes of creation." There is, therefore, nothing necessarily threatening to the Christian position arising from the biological theory of evolution.

At the same time, however, there has arisen a complex quasi-religious world view that we may call Evolutionism, which claims to deduce the answers to questions about meaning and purpose from the biological theory of evolution. Advocates of such a quasi-religious perspective often replace the concept of God with Nature, or in more extreme cases claim that one must conclude that pure Chance rules the universe. Although a Christian could accept the biblical doctrine of God's creating activity, a Christian can respond to Evolutionism only with rejection.

Unfortunately well-meaning Christians without a clear perspective on these issues have chosen to attempt their defense of the integrity of the biblical revelation by attacking in the wrong place. They have made three fundamental errors, each related to not penetrating the word maze.

First, they have confused the fact and meaning of Creation with the mechanisms of creation. Their insistence that we must choose between creation and evolution misses the crucial distinction between these words as descriptions of meaning and descriptions of mechanism.

Second, they have confused the philosophical errors of the world view of Evolutionism with the scientific questions of the biological theory of evolution. This has driven them often to a curious paradox: the attempt to use science to demonstrate that science is incorrect.

And third, they have confused a traditional interpretation of the Bible with the authentic requirements of biblical integrity itself. They believe that the integrity of the biblical revelation requires that the account of Genesis be interpreted as a literal, historical, scientifically accurate description of what actually happened on certain days in the past. Being children of their times, they almost automatically regard a scientific defense as the best possible defense, and therefore find themselves in the situation of trying to uphold the integrity of the Bible by demonstrating that it is scientifically accurate.

The Christian concerned with the errors of Evolutionism needs to attack at *that* point: to challenge the assumption that Evolutionism itself has a scientific basis, and that acceptance of the biological theory of evolution leads inevitably to the world view of Evolutionism. I am convinced that this battle can be won.

If we understand the meaning of these words properly, we see that evolution can be considered without rejecting Creation; Creation can be accepted in the biblical sense without rejecting evolution.

Can we hope that Christians will be more creative than to spend their energies attacking bad theology by attempting to discredit authentic science? ✣

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Book Reviews

THE MIRACLES OF JESUS AND THE THEOLOGY OF MIRACLES by Rene Latourelle (translated by Matthew J. O'Connell). New York: Paulist Press, 1988. 371 pages, index. Paperback; $14.95.

Books written by Catholic writers for Catholic theologians and clergy are always difficult for me. Their jargon is not mine; neither are many of their theological paradigms. While the author is a well-informed scholar who develops his arguments carefully, with due attention to both logic and evidence, much of what he discusses has little meaning for me. At least, much of it has little direct and obvious relevance for issues that are important to me.

Latourelle holds doctorates in history and theology. He is dean of the theology department at the Gregorian University in Rome where he teaches fundamental theology. He began a three-part presentation on the credibility of Christianity a decade ago with publication of a book on the historical origins of Christianity, *Finding Jesus Through the Gospels* (1979). This was followed by a book on whether Jesus and His message had meaning for human existence, *Man and His Problems in Light of Jesus Christ* (1983). This book completes the trilogy, asking if the miracles show Christ to be God-among-us.

An effort to address the credibility of Christianity falls within the sphere of apologetics. The most important question about any apologetic work is: Who is its audience? The answer to that question determines the appropriate terminology, presuppositions, categories of acceptable evidence, etc. Latourelle does not specify his intended audience. However, it is clear that he is writing for his fellow priests and other religious leaders within the Catholic Church.

The book begins with how one approaches miracles and those presuppositions that we bring with us to the subject. Then, all miracles of the Gospels are considered, with a great deal of attention given to the categories of miracles reported and the "sources" used by the Evangelists and their redactors. The philosophical concepts of miracles, the Catholic idea of a miracle, the sign values and functions of miracles, and how miracles are recognized are likewise given careful treatment. The book concludes with a chapter on the impact of miracles on the Christian life: how miracles relate to conversion and faith, holiness, the life of faith, and the Trinitarian life.

There are a number of historical insights and other valuable tidbits in this book, but I believe that most Protestant readers will think it not worth the effort required to sift through all peculiarly Catholic materials to find them, except those readers who are academic specialists in a related area.

Reviewed by D.K. Pace, The Johns Hopkins University Applied Physics Laboratory, Laurel, MD 20707.

COUNSELING AND SELF-ESTEEM by David E. Carlson. Waco, TX: Word Books, 1988. 268 pages, appendix, bibliography, notes, index. Hardcover; $12.95.

This book is the thirteenth volume in a series of books. "Resources for Christian Counseling," under the general editorship of Gary R. Collins. The author of the book, David Carlson, has graduate degrees in sociology, theology, and social work. He has over 27 years of experience in family and individual counseling. Currently, he is a professor of counseling psychology at the Caribbean Graduate School of Theology in Kingston, Jamaica, and also visiting professor of counseling psychology at the Divinity School of Trinity College.

This is the first book David Carlson has written, although he has published several articles and often given lectures on self-esteem at seminaries and churches. After reading this book, I hope he decides to continue to write more books.

Chapters 1 and 2 explain Carlson's definition of self-esteem based on the values of being "lovable, valuable, and capable because God created, redeemed, and empowers me." Chapters 3-6 and 10 deal with teaching people to build self-esteem in themselves, their children, and troubled families within the church through a twelve-step process which includes acknowledging the problems low self-esteem produces, believing that loving yourself is acceptable to God, validating yourself, making realistic demands on yourself, and being as patient with the process of learning to love yourself as is God. Also, Carlson shows how to build self-esteem by using the sensory process (identifying and using sensory predicates and eye-scans).

In chapter 11, Carlson concludes his book by explaining that counseling is an on-going process, not just something that takes place one time. As he states: "A helper's answer to a person's question remains the helper's answer until the person can make it his or her own. An answer, therefore, is no more a solution than a prescription is a cure."

I began this book prepared to do mental battle with the author, since much of the Christian literature I have read about self-esteem has dealt with it from a fairly humanistic viewpoint. Therefore, I was delighted and surprised when I read Carlson's book. He approaches self-esteem from a biblical perspective, and he uses scripture to back his points.

This book is very readable, even if the reader is not well-versed in counseling or psychology. Terms are defined, charts and lists are amply used, and each chapter ends with a summary. This book does not just explain self-esteem, it teaches how to build self-esteem through a process of exercises and techniques.

Counseling and Self-Esteem was written for several audiences: ministers and counselors, lay-people who want to increase their self-esteem, as a textbook for students of counseling; and anyone who wants to help build others' self-esteem. I feel anyone would find useful information in this book for dealing and communicating with other people.

Carlson states three goals he hopes the book will accomplish: "(1) provide the pastor and counselor with an understanding of self-esteem as a fundamental ingredient to one's spiritual, emotional, and social health; (2) teach accurate, biblical views of self-esteem; and (3) teach counseling strategies that can be used for building self-esteem and for dealing with other counseling problems." In this reader's view, he has accomplished his goals well.

Reviewed by Monell Weatherly, Route 1, Box 168-A, Itasca, TX 76055.

Books Received and Available for Review

(Please contact the book review editor if you would like to review one of these books.)

G. Albers, *Counseling the Sick and Terminally Ill*, Word
D. Anderson & R. Richard, *The Way Back: A Christian's Journey to Mental Wholeness*, Word
J. Anderson (ed.), *Living Ethically in the 90's: Confronting Key Issues In This Generation*, Victor
W. Byrd & P. Warren, *Counseling and Children*, Word
R. Ecker, *Dictionary of Science & Creationism*, Prometheus
C. Freudenberger, *Global Dust Bowl*, Augsburg
F. Hoyle & C. Wickramasignhe, *Cosmic Life Force: The Power of Life Across the Universe*, Paragon House
J. Moore (ed.), *History, Humanity, and Evolution*, Cambridge
J. Pawson, *Leadership is Male*, Thomas Nelson
V. Stenger, *Physics and Psychics: The Search for a World Beyond the Senses*, Prometheus
S. Wilson, *Counseling Adult Children of Alcoholics*, Word

Almost everyone who reads *New Testament History* will want to know more about the people and events mentioned, as well as the biblical materials dealt with. But, as congregations often remind preachers, it is better to quit while people want to hear more, than to go on after they have lost interest.

New Testament History is a good textbook for college classes dealing with the background of the New Testament. It is also useful to pastors and other Bible students as a refresher course or a reference manual to help understand the background of the New Testament.

Reviewed by Joseph M. Martin, Missionary-in-Resident, Belhaven College, Jackson, MS 39202.

NEW TESTAMENT HISTORY by Richard L. Niswonger. Grand Rapids: Zondervan, 1988. 183 pages, notes, appendices, bibliographies, indices. Hardcover.

Richard Niswonger, chairman of the Division of Social Studies at John Brown University, has prepared a clearly written brief history of New Testament times. He begins with a history of Palestine from 332-40 B.C., follows that with other events and developments leading up to Jesus' coming, then presents the life of Jesus and the early years of Christianity from a historian's perspective. He also deals with the historical setting of New Testament books, the expansion of the early church and its relation to the Roman Empire and Judaism, up to the year 100 A.D.

Niswonger has done a creditable job of simplifying a long and complicated period of history. He has woven together the historical context and the biblical books. By placing in one volume a historical survey and the setting of biblical texts, he has rendered a useful service to Bible students. Often New Testament introductions assume a knowledge of the historical context—an assumption usually unwarranted. Niswonger has helped fill that gap.

DARWINISM AND THE DIVINE IN AMERICA: Protestant Intellectuals and Organic Evolution, 1859-1900 by Jon H. Roberts. Madison, WI: University of Wisconsin Press, 1988. 242 pages. Hardcover; $26.75.

Jon H. Roberts, director of the American Studies Program at the University of Wisconsin-Stevens Point, divides his historical survey of the Darwinian controversy in America into two chronological segments. Part One considers the general character of initial reaction among "Protestant intellectuals" to *The Origin of Species*. During the period from roughly 1859-1875, concern among Protestant leadership in the U.S., says Roberts, focused on the *scientific* merits of the "transmutation hypothesis"—with critics content to punch scientific holes in Darwin's theory in order to uphold the requisite role of God in natural history as revealed in Scripture. Drawing primarily from quarterly journals and major works by "mainline" Protestant opinion-makers, Roberts ascertains a general assurance that science itself, which made evident the handiwork of God, would render Darwin's purely

physical and gradual change untenable. To the extent that organic evolution by natural selection denied design, it would soon betray itself as a misuse of science in service to the cause of philosophical naturalism by "the partisans of unbelief."

In Part Two, Roberts' assessment of the literature of the last quarter of the nineteenth century detects a shift of concern. The theological implications of Darwinian decent with modification gained greater attention as the transmutation hypothesis itself gained wider acceptance among the developing scientific community. "Literature Americans" and "religious thinkers" began to suggest various ways of either accommodating traditional theology to, or defending it against, the concept of organic evolution. The resulting "reconstruction of theology," as well as the various defensive strategies put forth, echo in today's debates over the character of the Creator's involvement in creation, evidence of that involvement, and the proper balance between scientific and biblical authority.

The author follows the revisionist theme advanced in recent years by a number of historians, arguing for the bankruptcy of the "crude metaphor of warfare" between science and religion. Like James Turner in *Without God, Without Creed*, Roberts suggests an ironic complicity of Protestant intellectuals in the eventual dethronement of Christian theology from its formative influence on American culture: "I am convinced that an examination of the role that Protestant apologists played in the glorification of the scientific investigation of the natural world [prior to Darwin] and the response they made when confronted by one of the major results of that investigation sheds a good deal of light on the process by which the currency of Christian theology became devalued in the intellectual life of the West" (p. xv).

In sum, Roberts' book is a detailed treatise on a "secularization" process in which American Protestant "religionists," lacking a formula and a consensus for balancing truths of scientific and biblical testimony, ended up forfeiting intellectual ascendancy to voices unconcerned with substantiating divine agency or sustaining a sacramental vision of the natural world. The division of labor that occurred between the empirical sciences, offering an "intramundane" description of natural phenomena, and theory, supplying categories of ultimate explanation, affected this shift in the locus of cultural authority. Roberts contends that empirically verifiable "description" became so "enamoring" that, by 1900, "many educated Americans ... derived little emotional and intellectual stimulation or engagement from a theophanous view of nature that could be defended only on the grounds that it was an accurate rendition of reality. Many, indeed most, of these Americans did not militantly deny the validity of the theistic approach to nature; they simply disregarded that approach" (pp. 239-40).

Admittedly, this is intellectual history from the top down, and Roberts draws upon a necessarily limited number of outspoken "representatives" of the various points of view. He concedes the confines of his approach, as well as the generally amorphous and arbitrary classification of "Protestant intellectuals." And though he acknowledges the differences and disagreements among contending evolutionary theories of the time, he equates Darwinism—with its specific mechanism of natural selection to account for change—with the more general concept of organic evolution. He justifies the equivalence, while other historians are being careful to recognize the differences, by virtue of the fact that antagonists in the debates came to equate the two.

Still, Roberts' use of primary sources is extensive, and he manages to construct a coherent picture of the tangled bank of evolutionary ideas and the gradations of Protestant responses. The reader senses the vagaries inherent in the transition from a time when the "testimony of Scripture and the pronouncements of modern science" seemed more readily compatible, to a time when the language of theology lost relevance in the face of the increasing prestige and autonomy of the natural sciences. Though meant for more the scholar than the lay reader, Roberts' treatment, for which he won the Brewer Prize of the American Society of Church History, certainly provides accessible and ample evidence for his concluding lament: "If the vocabulary and categories of Christian theology have become insignificant in shaping the way that many literate Americans comprehend the natural world, this is due at least in part to the inability of Protestant theologians and clergy to offer a convincing means to escaping the cultural consequences of that affiliation [between religious and scientific truth]." It is an historical reflection pertinent to the present efforts aimed at fostering the dialogue between theological and scientific insight.

Reviewed by William A. Durbin, Jr., 308 Oakridge Road, Cary, NC 27511.

THE WORLD THAT PERISHED by John C. Whitcomb (revised edition). Grand Rapids: Baker Book House, 1988. Paperback; $9.95.

Question: How did kangaroos reach Australia from Mt. Ararat after the Flood? Answer: They hopped.

This is the gist of the answer that John C. Whitcomb, Jr. provided in 1973 in the original edition of this book. Fifteen years later, in the revised edition, his answer was the same, word for word, except for an updated *National Geographic* reference to the (now submerged) land bridge between Indochina and Australia.

No one doubts that Australia was at one time connected to the mainland by a land bridge; no one doubts that kangaroos can hop a long distance. The problem is that the kangaroos would have had to survive many diverse climatic conditions (conditions that they are today incapable of tolerating), and find the appropriate kinds of food (in a world just devastated by the Flood) during

this journey. Perhaps it is not so strange that kangaroos should be found only in Australia; the mystery is, why are or were almost all marsupial species found only in Australia and Tasmania? Why would almost all marsupials have chosen Australia as their destination after debarking from the Ark? Whitcomb seems unaware of these problems, or else wants to create the impression that these difficulties do not exist.

This example is representative of the difficulties of this book in both its editions. (It is not the only example. Question: Why did the dinosaurs become extinct? Answer: They didn't.) The Global Flood theory has many serious problems, to which Whitcomb provided almost flippantly facile responses in 1973. Despite the volume of literature that has been written about the Flood since then, Whitcomb made no substantial improvements in his arguments in 1988. Revisions indeed there have been, although almost all of the text remains word-for-word the same: some books written since 1973, such as books by Youngblood and by Dillow, are summarized and discussed at length. A new insert about Mt. St. Helens, and a (very poor) insert called "Factors in Conflict with Standardized Chronology," were included. The 1973 misprint, in which the titles for chapters 1 and 2 were switched, was corrected.

I believe that the Global Flood theory can be rationally (though not successfully) defended. The young-earth creationists are smart enough to give us old-earth creationists and theistic evolutionists a run for our money, but one will find no such intellectual stimulation in this book.

Most scientifically trained readers can spot the scientific errors in this book. But more serious are the invalid theological arguments that Whitcomb presents. Whitcomb takes the Flood account in Genesis strictly literally. Like all literalists, however, he admits that the Bible contains figurative language. In particular, he admits that the Genesis 41 reference to "the people of *all* the earth came to Egypt to buy grain" refers only to those nations that could come in contact with Israel, rather than the whole globe (1988, p. 61). He insists that Genesis 1-11 refers to the history of all mankind, and therefore its universal terminology really is literally universal. The problem is that *right in the middle of the Flood account*, the Bible uses language that even Whitcomb would admit must not be taken literally: "The windows of heaven were opened." Whitcomb refers to this verse on p. 37 (1988 edition) without mentioning this problem.

A more serious theological problem is that Whitcomb does not recognize his interpretation as a mere interpretation. I think we would all agree that the Bible is without error in all that it affirms, but that our interpretations (including Whitcomb's, and mine) are subject to error. But Whitcomb doesn't seem to recognize his own human fallibility. He spent almost the entire fourth and final chapter telling his readers that the only reason that anyone would doubt the Global Flood theory is that they do not believe that the Bible is truly God's word. Any Christian who doubts the Global Flood theory does so because he thinks that geologists are superior to Scripture (p. 107), and have merely bowed to pressure from evolutionists (p. 97). Whitcomb says that the only reason that Davis Young accepts an old age for the earth is that "geologists have spoken" (p. 106). Much of this final chapter is criticism of the American Scientific Affiliation, which Whitcomb thinks has rejected the Bible as God's word. He refuses to admit that its members might have evidence to support their beliefs; instead, he says that members are merely permitting uniformitarian concepts of earth history to dominate their Bible interpretation (p. 64, footnote on p. 34).

Perhaps the most serious theological problem emerges when Whitcomb says that "if the Bible is beyond the reach of scientific control and is not vulnerable to the results of scientific ... research, its concepts become as puerile and insipid as the adventures of ancient Babylonian deities ... " (p. 119, both editions). I am amazed that a conservative theologian would aver that the *only* difference between the Bible and the Gilgamesh Epic is that the Bible is scientifically accurate! I always thought that the Bible gives us true, and the pagan writings false, information about God Himself.

I, for one, was hoping to critically examine my own beliefs by reading this book. However, anyone who was disappointed by the first edition of *The World That Perished* will be even more disappointed by the second.

Reviewed by Stanley Rice, The King's College, Briarcliff Manor, NY 10510.

LOGIC AND AFFIRMATION: Perspectives in Mathematics and Theology by John Puddefoot. Edinburgh: Scottish Academic Press, 1987. xxii + 209 pages. Hardcover; $20.75.

It may seem too presumptuous to put two so different domains on the same level: mathematics and theology. Do they have anything in common, except superficial similarities? A strong division between science and nonscience, drawn by the philosophers of the Vienna Circle, is pretty much alive. And there they are: mathematics, the realm of precision and certainty, versus theology, a quagmire doomed to rely only on wishful thinking; the former being governed by reason, the latter by emotions. But, is it really so? Is mathematics as precise as it is thought to be, and theology so open to the "anything-goes" approach? That is the theme of a very interesting book, *Logic and Affirmation*, written by a professor of both mathematics and theology.

Especially since Descartes, it seems reason has been severed from emotions. Establishing truth and infallibility of knowledge has started to rely solely upon sentences of reason, because reason strives for precision and abstraction, axiomatization and proof being the means thereof. But, as Heisenberg remarked, in this process "the immediate contact with reality is lost" (p. 18), that is, the

more precise and formal the system of knowledge, the less it has to do with reality.

The author fights the idea that proof merely demonstrates what is already implicitly contained in axioms. Proof is valued because of, for instance, the preservation of truth, communication, and clarification. Proof is to establish that a statement is an element of a larger context whereby both the context and the statement can be better understood. Proof is not a purely mechanical activity, otherwise it could be performed by computers. However, rather modest results in automated reasoning indicate that such a goal is at least in the remote future. Search for a proof involves emotions, intuition, "nose," the whole personality of the researcher; that is, those aspects that are not themselves subdued by formal treatment. Precision, therefore, rests upon imprecision. Thus, "mathematics is an interesting *personal* enterprise in which the commitment of the researcher to his hypothesis plays a large part in his success" (p. 52). The same holds for the quest for axioms; although, theoretically there are an infinite number of equivalent sets of axioms, only a handful are seriously considered. And again, intuition and "barely-understood processes of the unconscious mind" are the guides. Moreover, "the axioms or premises themselves have a history, and their hold upon us arises from our participation in that history, not vice versa" (p. 195).

The achievements of science may have been the reason for pushing feelings and emotions into the sphere of the unscientific, and retaining reason as the only legitimate engine of progress. However, there should be a full harmony between all aspects of human personality. If some human skills, such as believing or dreaming, are not practised because of their unscientific status, they may be lost and we may not know any more "what it is to be fully human" (p. 5). Therefore, reason has to be integrated and balanced with other aspects of being human. Slipping into absolutism or relativism is not the solution. The path traced by Michael Polanyi in his concepts of post-critical philosophy and personal knowledge is such a solution. Puddefoot gives an interesting discussion of these concepts, especially stressing the problem of self-centeredness and other-centeredness, where the "other-centered rationality recognises the priority of that which is other than ourselves, and leads us to the insight that it is the other which calls us into being and enables our becoming" (p. 93).

Formalism has to be dismissed both from mathematics and theology; it can be merely a means, and not the goal. Understanding is the goal, other-centered understanding, and actions that are based upon this understanding. Thus, formal systems are not to be treated as containing the truth but "as *clues and pointers* to the truth ... as signposts, guides and even rungs on a ladder of understanding" (p. 193).

Formal systems and doctrines are letters that kill, and only the Spirit makes alive. The truth, whether in mathematics or theology, cannot be encompassed by one system. Gödel proved it for mathematics, and in theology it would mean that the infinite reaches of the reality of God could be enclosed in a doctrine. There may be a temptation to think that way about a doctrine, but a scriptural truth can be very helpful here: "whoever thinks he knows something really doesn't know as he ought to know." This truth can be applied to both mathematical and theological systems, and Puddefoot's book is an excellent discussion of this problem.

Reviewed by Adam Drozdek, Duquesne University, Pittsburgh, PA 15282.

THREE SCIENTISTS AND THEIR GODS: Looking for Meaning in an Age of Information by Robert Wright. New York: Times Books, 1988. 302 pages, bibliography, index. Hardcover; $18.95.

This slick, urbane, sometimes perceptive, sometimes patronizing apologia for agnosticism is written by a senior editor of *The New Republic*. Previously, as an editor at *The Sciences*, his column "The Information Age," won the 1986 National Magazine Award for essay and criticism. Here he intertwines interviews with computer scientist Edward Fredkin, sociobiologist E.O. Wilson, and economist Kenneth Boulding with his own analysis of them, their opinions, and references to other writers of equivalent relevance. Each of these sections is separated by reflections of the author on information, meaning, communications, and complexity.

The use of the word "Gods" in the title of the book is metaphorical at best, and the reader should not expect to receive a perspective on how scientists of repute have worked out their theology and relationship to God. The author tells us that he was brought up a Southern Baptist, "encountered the theory of evolution as a teenager," was "bowled over by its power and beauty," and had permanent damage done to his religious faith as a result. This is not surprising, since the author indicates that only a deistic view of God is acceptable in scientific circles. His somewhat reluctant willingness to advocate agnosticism hinges on his contention that the theory of natural selection is not quite adequate to describe human consciousness. This theme persists to the very last pages of the book, when the author confides:

> So if life's having some meaning is dependent on its having an intelligent creator, we're out of luck; science, by itself cannot support any position on this question more consoling than agnosticism. ... What does it mean that some fairly reasonable (as these things go) attempts to extract purpose and meaning from evolution bear results remarkably like longstanding doctrine of the world's great religions? Is it just a coincidence? ... Personally, I don't know what to think. But I think about it often. (pp. 299, 302)

The people whom he has chosen to interview echo his sentiments. Edward Fredkin "posits not only laws but a law enforcement agency: a computer. Somewhere out there, he believes, is a machinelike thing that actually keeps our individual bits of space abiding by the rule of

the universal cellular automaton" (p. 61). More specifically Fredkin is quoted as saying:

> I don't have any religious belief. I don't believe that there is a God. I don't believe in Christianity or Judaism or anything like that, okay? I'm not an atheist. ... I'm not an agnostic. ... I'm just in a simple state. I don't know what there is or might be. ... But on the other hand, what I can say is that it seems likely to me that this particular universe we have is a consequence of something which I would call intelligent. (p. 69)

Whereupon he falls back on what seems remarkably like the largely discredited, traditional Argument from Design. At the conclusion of his interactions with Fredkin, the author asks him, "What is the meaning of life?" Fredkin replies, "It has to do with intelligence and information and all that. I think our mission is to create artificial intelligence. It's the next step in evolution" (p. 80). In reflecting on his interaction with Fredkin, the author finally comments, "DNA is thus what first gave meaning to life; or, perhaps, what first created meaning. In any event, it is very impressive stuff" (p. 110).

E.O. Wilson's life parallels that of the author. Wilson also had a Southern Baptist upbringing, accepted the "invitation" and stepped forward to receive Christ as his Savior. "Barely two years later, the ritual's philosophical foundation was displaced. 'It was in college that I came up against it in its full grandeur,' he says of the theory of natural selection" (p. 125). In his treatment of evolutionary biology, he argues that "moral and ethical intuitions are shaped by the genes," and he "satirizes the alternative view—that morality is an 'angelic code,' 'divinely given' or discerned by humans with their 'superior intelligence' " (p. 115). His position is that religious feelings have adaptive value and are therefore in our genes.

Wilson is concerned that this "religious drive" be put to good use. It is true, he believes, that "evolutionary biology has shown the creation myth to be just that," and so what we must do is to "cultivate a 'scientific humanism' that taps the energy of our innate religious drive" (p. 190). Scientists and theologians working together can salvage the situation, and "religion can survive as a coherent body of information if it is willing to put up with substantial editing" (p. 191).

Finally, the author asks Wilson if he doesn't " 'long for the days when he believed there was a God up there watching over him? Doesn't he lose any sleep over life after death?' He shakes his head firmly, 'None,' he says finally and proudly, 'I don't worry about my own immortality' " (p. 192).

The author's treatment of Kenneth Boulding is the most diffuse of the three. This is partially because the author interjects a lengthy discussion of Teilhard de Chardin in this section. But it is more than this: while constantly referring to Boulding's major achievements and intellectual prowess, he just as constantly pictures Boulding as rambling, almost incoherent, and inconclusive. "He is the most obliging and agreeable man I have ever met" (p. 217). Boulding is the author of some forty books, but the author quotes him as saying that one of his mottos is, "Don't get it right; get it written" (p. 222).

Of the three men reviewed in the book, Boulding is the closest to having a genuine religious conviction. He is described as having "changed from an Englishman, a Methodist, and a chemist to an American, a Quaker, and an economist" (p. 220). But when it comes right down to it, his quoted responses show little traditional content. The author asked him "if he can say for *certain* whether there's anything, you know, out there." Boulding's reply is, "It's a good question, and I don't quite know the answer to it. Actually, I'd put it this way. What I feel very certain about is the existence of potential. ... I think perhaps the real core of the religious experience is the experience of potential" (p. 292). Or, again when the author asks Boulding, "Do you sometimes have the feeling that you're in academia as a sort of undercover agent of God?" Boulding replies, "No, I don't think so. ... No" (p. 295). As the author leaves, Boulding gives him a copy of a pamphlet he has written, "Mending the World: Quaker Insights on the Social Order." His book *The Logic of Love* remains unwritten.

If you enjoy popular science and personal interviews, this book is a polished presentation. If you're looking for something more, you probably won't find it here.

Reviewed by Richard H. Bube, Professor of Materials Science & Electrical Engineering, Stanford University, Stanford, CA 94305.

FREUDIANISM: A Critical Sketch by V.N. Volosinov. Bloomington, IN: Indiana University Press, 1988. 187 pages. Paperback; $9.95.

JUNG: A Biography by G. Wehr. Boston: Shambala, 1987. 550 pages, index. Hardcover; $25.00.

These two books provide an interpretive analysis of two early figures in the discipline of psychology: Freud and Jung. Freud's contribution is assessed by a Russian, V.N. Volosinov, while Jung's life is given an historical summary by a German author, Gerhard Wehr. This review will focus primarily on Volosinov's book and only secondarily on Wehr's book.

Volosinov's critical examination of Freud was written in 1927, during a period of incredible intellectual ferment in the Soviet Union that was bounded by the October Revolution and the Stalinist purges. This book reinterprets Freud from an historical and objective perspective. Volosinov (1895-1936) grants the validity of much of what Freud observed as therapist and "scientist," but he suggests a more sociological interpretation. Even more, the work is an evaluation of psychology as it emerged in a capitalist setting. Given the current climate of *glasnost*, it is appropriate that Western psychologists experience what

it means to have their major historical figures interpreted from Soviet soil at a particular point in time.

Of the nine chapters, the first two are devoted to an explication of the nature of ideology in psychology and the nature of the tension between subjective and objective psychological methodologies. The next four chapters are an analysis of the basic tenets of Freud's writing up to 1927. There is little new here for the scholar who is familiar with Freud. The last three chapters are a critique of Freud from an historical and objective perspective. It is these chapters which reveal how far ahead of his time Volosinov's analysis was. Such a critical analysis of psychology is still barely understood in the West.

Freud, according to Volosinov, does not emerge in a social vacuum: "Every utterance is the product of the interaction between speakers and the product of the broader context of the sole complex situation in which the utterance emerges" (p. 79). Freud's reduction of the psyche to biology occurs precisely at that point in history when there is an increase in social dislocation and disintegration, a view of the European culture strongly held by Volosinov. Similarly the emphasis on infantile sexuality is a reflection of social forces external to Freud rather than a "scientific" discovery. The biologization and sexualization of the person are ideological. To understand the psyche one must look to the historical, not the natural. In fact, an emphasis on the biological is a way of defending the *status quo* and retarding social change.

Volosinov critiques Freud's system for its subjectivism. Its concepts (e.g., instincts, unconscious) are difficult to locate historically and objectively. The unconscious, Volosinov suggests, is only a different kind of consciousness, one that reflects socially dissociated fragments. The unconscious is revealed through verbal interaction just as the conscious. The difference is that the so-called unconscious reflects a different ideology. Just as the theory of the therapist reflects hidden social forces, so also does the unconscious reflect the play of social forces internalized in the psyche.

The book also includes in appendixes two additional papers by Volosinov which focus on art and other attempts by Soviet theorists to incorporate Freudian thought. Volosinov's *Freudianism* is an important historical study and will be of interest to historians and philosophers in psychology in particular, and to those interested in the relation of society to the individual in general.

Wehr's analysis of Jung is a book of a different sort from Volosinov's. Its approach is chronological. He reviews Jung's early dreams, studies Basel, and his experiments in parapsychology. The meeting with and subsequent break with Freud is given adequate treatment. With much detail Wehr describes Jung's various journeys, his traveling and tower building, and his encounter with alchemy. With considerable clarity, Wehr explains the Jungian concepts of the collective unconscious, the archetypes, active imagination, and individuation. He indicates Jung's facility with myth and his critique of arid rationalism.

The book makes extensive use of Jung's own biography, *Memory, Dreams and Reflections*, his collected works and letters. This is currently the only available biography of Jung which covers his life with such detail. In addition to twenty-eight historical chapters, Wehr has included three interpretive essays.

This is an appreciative review of Jung's life. Unlike Volosinov, there is little critical analysis. What is lost in careful analysis is compensated for with considerable detail. For the person interested in a complete history of the life of Jung, this is a most appropriate book. For the historian interested in having as much data as is available on Jung in one book, this is the best volume. For the scholar interested in a more in-depth historical assessment of Jung, there may be some disappointment.

Reviewed by Al Dueck, Associate Professor of Pastoral Counseling, Mennonite Brethern Biblical Seminary, Fresno, CA 93727.

MEDICAL ETHICS AND ECONOMICS IN HEALTH CARE by Gavin Mooney and Alistair McGuire (eds.). New York: Oxford University Press, 1988. 159 pages, index. Hardcover.

In September 1986, a small international, interdisciplinary workshop was held at Lisse in The Netherlands on medical ethics and economics in health care. This book is a collection of the papers presented at that meeting (slightly revised). The contributors were from Denmark, England, Germany, The Netherlands, and Scotland. Their disciplines included economics, various health and medical fields, law, and philosophy.

For most of us, this book is ahead of its time. It tackles the macro-issues of health care. Most of us have not yet begun to think in such terms. We just complain about the size of the medical bill as individuals. The European orientation of this book reduces its utility somewhat for American readers, but it still has much of value for us. Its treatment of material is balanced and careful. Topics covered specifically include: both economic and philosophical views of economics and medical ethics in health care; a critique of traditional medical ethics and economics in health care; the interaction of economics, ethics, law, and medical conduct, how medical ethics and economics will be affected by medical expert systems; and how medical ethics and economics relate to medical education, general practice, and clinical decision making.

Reviewed by D. K. Pace, The Johns Hopkins University Applied Physics Laboratory.

PROFSCAM: Professors and the Demise of Higher Education by Charles J. Sykes. Washington, D.C.: Regnery Gateway, 1988. 264 pages, bibliography, index. Hardcover; $18.95.

Parents send their children to major universities to sit at the feet of learned professors. These parents do not know that the professors—through the protection of tenure—have achieved the goal of avoiding almost all contact with undergraduate students.

The professors have successfully insulated themselves from university administrations, state legislators and parents, and fear only the peers in their academic disciplines across the nation.

These are the theses that the author develops, illustrates, and defends. Sykes is a reporter and editor, and has taught journalism at Marquette University and the University of Wisconsin at Milwaukee. His book appears to be well researched and offers extensive citations, but is full of anecdotes and appears easy to read.

In the "academic villages"—the nationwide communities of peers—big teaching loads have become a sign of low rank; avoidance of teaching is a prerequisite of eminence. Who then teaches the undergraduates? Universities fill the breach with graduate student instructors (many of them foreigners who don't handle English well) and adjunct professors hired on a year-to-year basis.

Effective teaching is often viewed as incompatible with serious scholarship, Sykes contends. Tenure is granted not on the basis of good classroom work, but on the basis of scholarship as evidenced by grants gained and articles published in the peer journals, however trivial the articles and however obscure the journals. Sykes quotes an estimate that there are 40,000 separate journals in the hard sciences alone. (There is irony here: Is this book review one more trivial article in one more obscure journal?) He cites one researcher of the journals themselves: "More and more people are writing more and more articles that fewer and fewer people are reading." Meanwhile, the journals perpetuate their own orthodoxies and suppress results that challenge them.

ProfScam deals at length with the dilemma of tenure. Tenure is justified on the basis that a lifetime appointment is essential to provide professors with the security to pursue truth unhindered. But tenure is also the ultimate protection from accountability. It is also academia's ultimate control mechanism, often used ruthlessly to snuff out dissent among junior professors who deviate from the standard line.

In a chapter entitled the "Abolition of Man", readers familiar with Francis Schaeffer will recognize parallels with the concept of the various disciplines sinking below the line of despair: absolutes disappear, black and white lose their meaning. In the humanities, Sykes says a central aim of pedagogy is the abolition of a traditional canon. A cult of meaningless is growing, called emancipated subjectivity. Texts are chosen not because they have inherent truth, but because they help elucidate a theory of the moment.

This reviewer would guess that most readers of *Perspectives* share Sykes' concern about the divorce between professors and teaching, and about the prostitution of curricula. They will appreciate the proposals for reform in his closing chapter, "Storming the Ivory Tower." Sykes recognizes that scattered through academia are keepers of the flame. He concludes:

> These professors know that every genuine idea, every article written in lucid prose employing logic and insight is a subversive act within the academic culture—a shot fired across the bow of the obscurantists, sorcerers, and witch doctors of profthink. These true scholars keep the tiny flame of learning alive on their campuses and within their disciplines. They will inevitably form the core of a reborn higher learning.

Reviewed by Fred P. Lollar, Associate Professor of Journalism, John Brown University, Siloam Springs, AR 72761.

THE PSYCHOLOGY OF HUMAN FREEDOM by Malcolm R. Westcott. New York: Springer-Verlag, 1988. 227 pages, index. Paperback; $34.00.

Human freedom is usually taken for granted when most discussions about it are presented. There are three assumptions which usually unite such discussion and literature: first, commitment to some form of free will doctrine; second, that life goes on in the context of social organizations; the third encompasses the belief that free will is desirable and society should inhibit its expression as little as possible. The implication is that when this is done, people have the opportunity to be creative.

The author has been stimulated by many others, primarily in the British tradition. Mortimer Adler's work has also made an important contribution towards Westcott's studies. This rather comprehensive book is divided into five main parts: I. Context; II. Psychological Studies: The Nat Sci Variations; III. Metaconsiderations; IV. Psychological Studies: The Hum Sci Variations; V. Further Facets of Human Freedom.

Westcott states that he has three goals to pursue: "The first is to describe what has been learned about human freedom through psychological research. The second is to provide a conceptual and methodological critique of the large body of that research which has been conducted within the framework of a positivistic natural science experimental psychology. The third goal is to offer a contrasting human science approach to the study of human freedom and illustrate its use in empirical study."

Considering the enormity of these goals, the author presents selected information about each. Each chapter follows a similar format: the plan, issues and conceptions, review of literature, and an overview or summary. As

he lists 10 full pages of references, the investigative reader could spend most of his life following up the suggested material.

It is impossible to give a comprehensive review of the author's work in a short review, but some of the flavor of his attitude becomes apparent in Chapter 9, "Loose Ends, Missed Opportunities, and Possible Futures." In this chapter he discusses some of the implications of cross-cultural effects and concepts of human freedom, privacy, and individualism. As these aspects strongly influence western cultural practices, they also influence concepts of freedom. Gibbs' concept of "optative freedom" is the capacity to be the organ to choose what to do. Such decisions are possible only in situations where there are both time and resources to allow such choices. If people spend most of their time in self-maintenance they have little time left for choosing other options. Thus, Third World concepts of free will can become very different from ours.

Political philosophies likewise affect what a person perceives as free will. Whenever there is a rigid pattern of thought that forces evaluation of all aspects of life to be explained or justified according to that pattern, concepts of free will are distorted. The author has some interesting insights into these questions as well.

Lines of argument about free will relate to several questions, namely, theological conceptions about the nature of God and man's relationship to Him; a second view related to morality, for if there is no free will there can be no judgment about behavior; the third view related to reflexivity, that determinism must itself be determined. Limitations and explorations of each of these areas are presented.

This book is one which is stimulating and helpful to anyone interested in the human condition. While it is abstruse in some ways, it is quite understandable to anyone with a background in the history of philosophy and psychology. I would suggest that it is aimed at the serious reader, as the high cost of the paperback would deter others from purchasing the book.

Reviewed by Stanley Lindquist, Professor of Psychology Emeritus, California State University, and President, Link Care Foundation, Fresno, CA 93710.

HEALING THE MASCULINE SOUL by Gordon Dalbey, Waco, TX: Word Books, 1988, 210 pages, notes, Hardcover; $12.99.

Now here is a book every American male ought to read! Beginning with every man's life-or-death dependency upon women while in his mother's womb, the author sets forth the need in every boy for a father to call him away from women into the company of men, and thereby become grounded in his authentic masculine identity. Men in our culture are unable to do that for boys, however, largely because their own fathers did not do it for them, states the author.

As a result, the average American male is floundering in an identity crisis. The women's emancipation movement calls him to "embrace his feminine side." In reaction, the media glorify the self-centered, destructive male, as in the macho Rambo image. "We are lost males, all of us: cast adrift from the community of men, cut off from our masculine heritage—abandoned to machines, organizations, fantasies, drugs" (p. 52).

This perceptive book takes a new approach to such problems as: Why do men have so few real male friends? Why do men fear women? How can sexuality and spirituality be reconciled? What is the real problem of homosexuality ("a non-political view")? Why don't men go to church? How can men recover the warrior role to live in courage, strength, and conviction? And what of failure in marriage? "Our problem today as men is not that we have failed to bond with a woman, but rather, with our own, manly selves. ... Without having thus bonded with his own masculine self—a man's effort to bond with a woman, as in marriage, can only be an escape from this, his true self" (p. 15).

Having lived and worked for over twenty years in Africa, I have often pointed out that Third World cultures have much to teach us. The author, from his own Peace Corps experience in West Africa, adapts a male initiation rite to a Christian setting as a means of calling young men out to an authentic, affirming male identity—a highlight of this book.

Author Dalbey "offers men new hope for walking in true manliness by yielding at last to the Father God, who in Jesus has shown all men the way to Himself—and to other men" (jacket).

Gordon Dalbey is an ordained United Church of Christ minister. His articles have appeared in a wide variety of publications. He teaches and leads spiritual growth programs for local churches, denominational events, and other Christian groups.

This book is well-written, contains many personal experiences, interesting illustrations, and practical suggestions. It deserves a wide readership and would be an excellent resource for a men's group, preferably led by a person with some experience and skills in individual and group counseling. You can't miss on this one!

Reviewed by Albert C. Strong, Retired, Silverton, OR 97381.

NUCLEUS: Reconnecting Science and Religion in the Nuclear Age by Scott T. Eastham. Santa Fe, NM: Bear, 1987. xxxviii + 209 pages. Paperback; $9.95.

Nuclear weapons became an unfortunate hallmark of our times, especially after Hiroshima. The nuclear issue, probably more than anything else, drives home the fact

that the earth is truly a global village. After the destruction of the entire planet became a real possibility, it became necessary to think in broader categories that involve more than a narrow backyard of a town or even a nation. "The nuclear issue is unavoidably an encounter with Death. ... As such, it is a primordially religious issue" (p. 12). Therefore the nuclear issue is to be analyzed, says Eastham, primarily from the perspective of religious studies, and that is his approach in *Nucleus*.

The author states that our universe consists of three worlds: heaven (the world above), earth (the world below), and man (the world in between). This division into three worlds can be traced, one way or the other, in all cultures. All cultures have to determine—implicitly or explicitly—their relation to the heavenly, the earthly, and the human.

Because no realm is insured against catastrophe, the author discusses the nuclear issue in reference to the three worlds. He sees the need for "a new cosmology, a new or renewed vision of the whole" (p. 37) and also a need for "a religious anthropology, that is, a cross-cultural anthropology of mutual understanding" (p. 56). In his quest for this "integral anthropology" Eastham refers to Christianity as a good starting point because of its concern for others.

The chapter dealing with the past presents many facts, some of them truly terrifying, concerning nuclear build-up. Most of these facts, however, are taken from the excellent book *Brighter Than a Thousand Suns* by R. Jungk.

In the chapter discussing the present, Eastham lists many topics that should be presented in the classroom in connection with the nuclear issue, such as arms negotiations, peace academies, pacifism, and even the ancient healing arts. He then briefly outlines the area of peace studies, where the distinction is made between military peace and religious peace. The next area is war studies, which tries to answer such questions as: Why war? Why sovereignty? Who is the actual controller?

Nucleus discusses issues of extreme importance, but it leaves the reader with a feeling of disappointment. Interesting observations and proposals are drowned in an irritating verbosity and pretentious style. His remark on page 75 stating that he "so freely filled previous pages" should be moved to the last page, because the book often loses focus as the author rambles among many themes. To me, the section discussing the present state of religious studies is of some interest.

Reviewed by Adam Drozdek, Duquesne University, Pittsburgh, PA 15282.

EXTRATERRESTRIALS: Science and Alien Intelligence by Edward Regis, Jr. (ed.). Cambridge: Cambridge University Press, 1987. 278 pages, appendix, index. Paperback; $12.95.

If you have been interested in scholarly theories concerning extraterrestrial intelligence (ETI), but have not had the opportunity to read the books, journal articles, and conference reports on the subject, this is the book for you. In *Extraterrestrials* editor Edward Regis, Jr., science writer and associate professor of philosophy at Howard University, brings together the reflections of notable scientists and philosophers concerned with the existence and nature of ETs. Some articles are reprints of past works and some were written specifically for this volume. All, however, are up-to-date and non-technical.

Fifteen contributors address common scientific and philosophical questions relating to ETs. What is the probability that they really exist? What are the prospects of contacting them? How would contact be made? What would be the philosophical and sociological impact of contact? Or of being convinced that we are alone? The book is comprised of six sections, each one commencing with a short introduction and summary by Regis.

Part one is an overview by Lewis White Beck. He introduces the reader to the history of the debate on the existence of ETs, the difficulties in their evolution and in communicating with them, and the possible sociological impact of confirming their existence.

In part two, Ernst Mayr argues that the evolution of intelligence on earth was so haphazard that the likelihood does not exist for ETI elsewhere in the galaxy. David Raup and Michael Ruse disagree. The former speculates that the exotic and sophisticated nature of life may give rise to non-intelligent creatures with powerful electromagnetic emissions (like the electric eel) which could be detected across interstellar distances. The latter is convinced that ETI would necessarily evolve, and that we and they would have enough common ground in areas of mathematics, logic, views of reality, and morality for intelligent communication.

The dialogue in part three focuses on the question of whether our kind of science is sufficiently universal to serve as common ground for ET communication. Nicholas Reshcher contends that different physical, chemical, biological, psychological, sociological, and epistemological factors in other civilizations will give rise to an unrecognizable form of science. Marvin Minsky, on the other hand, proposes that all intelligent beings are limited by space, time, and materials; hence, all will evolve similar methods to solve their problems. Our brand of science, therefore, can serve as a basis for communication.

Part four pits Frank Tipler against Carl Sagan and William Newman. Tipler contends that the lack of evidence for ET probes (UFOs excluded) argues strongly that we are the only technologically advanced civilization in the galaxy. Sagan and Newman counter with physical, psychological, and sociological reasons why we should not expect to see probes in spite of the existence of technologically advanced ETI.

Part five concentrates on the problems and methods of detecting and deciphering ET signals. Jill Tarter has participated in a number of investigations, and she describes what one is like. An appendix summarizing the history and nature of searches from 1959-1984 completes her essay. Cryptologist Cipher Deavours describes how modern decoding techniques would help decipher ET signals, and Hans Freudenthal ends this section with an exposition of LINCOS ("lingua cosmica"), an artificial language based on mathematical relationships which could serve as a galactic "Esperanto."

The final section examines the meaning and consequences of contact. In separate articles, philosophers Edward Regis, Jr. and Jan Narveson argue that moral norms and behavior on earth will continue pretty much along present lines whether we confirm the presence or absence of ETs. Robert Nozik concludes with a depressing short story which should dampen the enthusiasm of those who feel that contact with ETs will necessarily enhance the human condition.

The study of ETI is multidisciplinary, and Regis has done a good job in bringing together professionals of varying backgrounds to discuss the subject. The articles are balanced between proponents and opponents in number as well as in quality.

One is struck, however, by two features common to both sides. The first is the depth to which they have uncritically accepted the experiments of Stanley Miller and Manfred Eigen as proof that life of some sort has arisen in other portions of the galaxy. Given the horrendous problems with naturalistic explanations of the origin of life on earth, one can legitimately question the existence of ETI when based on these same explanations. Second, although scientists consistently warn against the dangers of a limited, anthropomorphic view of ETI, in reality their models are inescapably so. In spite of these philosophical shortcomings, *Extraterrestrials* will be enjoyable and helpful reading for those wishing to survey this exciting field.

Reviewed by Perry G. Phillips, Assoc. Prof., Natural Sciences, Pinebrook Junior College, Coopersburg, PA 18036.

MEDICAL ETHICS: Principles, Persons and Problems by John M. Frame. Phillipsburg, NJ: Presbyterian and Reformed Publishing Co., 1988. 122 pages, bibliography, indices. Paperback; $6.95.

The author is not a medical doctor writing from extensive clinical experience with illustrative case studies but rather the Professor of Apologetics and Systematic Theology at Westminster Theological Seminary in Escondido, California, and author of *The Doctrine of the Knowledge of God.*

The main treatise is only 73 pages long, preceded by an analytical outline of ten pages, and followed by two appendices—the first being "Recent Critiques of the Brain-Death Criterion," largely a discussion of the Uniform Determination of Death Act, 1983. The second is the Report of the Committee to Study the Matter of Abortion, Approved by the General Assembly of the Orthodox Presbyterian Church in 1972, of which Frame was the principal author. While this report *antedates* the Roe vs. Wade case of 1973 and recent sequel, it is included for its elaborate exegetical treatment of abortion. Other than this report, the problem of abortion is not discussed.

Also excluded are other issues of current interest as questions surrounding genetic engineering or the "new reproduction" (*in vitro* fertilization, surrogate parenting, etc.) and the difficult questions surrounding AIDS. Problem areas that are covered are: the ethics of medical research; the criteria of death; important distinctions in patient conditions such as death, dying, coma, terminal, handicapped; ordinary and extraordinary care; killing and letting die; living wills/durable power of attorney.

Frame uses scripture as the ultimate authority in focusing on three related areas: (1) "The Normative Perspective: Finding God's Will," giving guidelines in using Scripture; (2) "The Existential Perspective: Focus on the Patient," discussing patient autonomy, consent and disclosure, confidentiality, justice (e.g., equal treatment); and (3) "The Situational Perspective: Some Problem Areas," as listed in the preceding paragraph.

Frame carefully exegetes some specific biblical texts such as Exodus 21:22-25, but the size of the book does not allow for the development of key biblical themes like love, justice, mercy, etc. This is unfortunate, for the author himself thinks these concepts are often vaguely understood or appealed to; however, these "weightier matters" are often the reigning Christian concepts used to determine ethical questions, and they are anything but vague in scripture.

Some of the information I found to be helpful, but overall the book left me cold and uninspired. Frame's style tends to be academic, his attitude severe. I wondered why he didn't soften his presentation, since he himself admits in the preface, "much of my own thinking in these areas is tentative, perhaps more tentative than the language of the book itself may suggest." He identifies himself with evangelicals by espousing scripture alone as the ultimate authority in reaching ethical decisions. Yet as important as *sola scriptura* is, it is not the basic tenet of evangelicalism. Regrettably there is little expression of the fruit of the Spirit in Frame's presentation that would redemptively touch the non-Christian reader. I missed the compassion, understanding, and deep human wisdom of a Paul Tournier or a Lewis Smedes.

[Note: On page 12, the reference to Exodus 22:12-36 should be corrected to Exodus 21:12-36.]

Reviewed by Albert C. Strong, Retired, Silverton, OR 97381.

TILLICH'S RESPONSE TO FREUD by John M. Perry. Lanham, MD: University Press of America, 1988. 72 pages, index. Paperback; $8.75.

The usual response of a theologian to Freud is that of repugnance. However, in this brief review of Freud's atheistic views followed by Tillich's response, there is a different approach. Tillich uses Freudian ideas to review and illustrate further thoughts about theology as a method to explicate and clarify some of the ideas about ultimate reality.

At times one wonders if Tillich was using Freudian ideas as a screen to project his own view, translating what Freud said into terminology which was more acceptable to a Christian. For example, his discourse about Freud's idea that God was a projection of people's needs is explained by suggesting that there has to be a place to project, and this screen may be ultimate reality. Therefore, because there has to be such ultimate reality, Freud proves the opposite of what he originally intended. While this concept was left unclear, so that each reader could also project his own ideas into the discussion, at times it seems that an apologetic for Freud is being presented. The important point here is that Freud's ideas require reevaluation of what we often take for granted.

However, there is no question that Tillich is sincere in his rejection of the atheistic ideas of Freud, and takes Freud to task as well as one can from writings alone. However, he also pointed out that "it would be wrong to refuse to listen to what Freud said about *psychological reality*, simply because we know in advance that we will not agree with some of his philosophical conclusions." The main problem of this book is the rather brief treatment of a controversial subject.

The book is divided into five chapters. The first one reviews Freud's view of God as a projection and religious faith as an illusion. In the second through the fifth chapters, the author rather skillfully maneuvers quotes from original sources which seem to compare and react to the subject matter discussed. The author adds some interpretation and organization which allows the rather abstruse subject matter to flow reasonably well.

Chapters two to four cover Tillich's response to Freud's existentialism, scientism, and view of God and Religion. Chapter five is a summary and conclusion about the subject matter. He lists the points of agreement with Freud, of which there are 11, and follows with the points of disagreement, of which there are 13, with a brief exposition about each. This summary brings together the points previously discussed and highlights the main points of the book very well, and perhaps should be read before reading the main text.

The contribution of Freud to Christian theology is in bringing insights, especially "enabling it to better recognize the unconscious psychological factors that can motivate a man to seek a false and idolatrous security in his relationship to God." Tillich's interaction could be interpreted as a way of making Freud more palatable to the Christian, which may open the door for some to uncritically accept further Freudian concepts. This could have negative results.

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WOMEN, FIRE, AND DANGEROUS THINGS: What Categories Reveal About the Mind by George Lakoff. Chicago, IL: The University of Chicago Press, 1987. 614 pages, bibliography, indices. Hardcover; $29.95.

Lakoff is professor of linguistics at the University of California, Berkeley. During the 1960s and 1970s, he was one of the leading linguistics investigating the relationship between natural language and logic. More recently he has become active in the area of cognitive science. This book represents a continuation and elaboration of the ideas presented in *Metaphors We Live By*, coauthored with Mark Johnson (1980).

The goals of this book are ambitious: to show that "objectivism" is untenable, and can and should be replaced by "experientialism." Both objectivism and experientialism assume that the world exists independently of any observer.

Objectivism, according to Lakoff, holds further that categories, logic, and concepts exist independently of the observer. Knowledge and reason, in this framework, are accurate to the extent that they reflect the independently existing categories and logic. Finally, cognition is the manipulation of abstract symbols which are then tied to entities in the world.

Experientialism, on the other hand, holds that the objective world can only be known through the experiences of the observer. In experientialism, categories, logic, and concepts, knowledge and reason, exist only through the interaction of the observer with the objective world.

Lakoff proposes that cognition is based on two types of structures. First, there are "basic-level categories," generally corresponding to the genus level in biology, which are perceived as gestalts. Many of these categories are based on "prototypes," that is, the best representative of a category. These categories form the basis of both superordinate and subordinate categories. Second, there are basic schemas such as "container" that are based on common experiences. These "kinesthetic image schemas" form the basis for more complex schemas. More complex cognitive structures are built from combinations of categories and schemas. Lakoff objects to the claim that categories and schemas which are not predictable must be arbitrary. He claims instead that they can be motivated on the basis of basic experiences.

Women, Fire, and Dangerous Things is divided into two

"books." In Book I, "The Mind Beyond the Machine," Lakoff presents evidence against objectivism and develops the experientialist alternative. Then three detailed case studies are presented in Book II to show that experientialism can deal with phenomena normally handled by objectivism, as well as with phenomena which prove problematic to objectivism. The studies deal with the concept of anger, the word *over*, and grammatical constructions involving *there*.

Book I is divided into two parts. Part I, "Categories and Cognitive Models," presents evidence from psychology against the objectivist view of categories. After an historical overview including the findings of Wittgenstein, Berlin and Kay, and Rosch, among others, Lakoff deals with a wide range of categorization found in natural language which indicates that categories are products of the observer. (The book title is based on the categorization of women, fire, and dangerous things in Dyirbal, an Australian aboriginal language, where they are categorized together although they do not share common traits.) Part II, "Philosophical Implications," deals with philosophical objections to objectivism. Putnam's claim that "it is impossible to stand outside reality and find a unique correct way to understand reality" (p. 260) plays a central role in this section. Other arguments in this section deal with the use of abstract symbols in mathematics and artificial intelligence, and the concept of the biological species. The implications of experientialism for "hard" sciences are also discussed.

Although little of the data in this book is original, this does not detract from the book. Lakoff does a remarkable job of drawing from fields as diverse as psychology, linguistics, philosophy, biology, and mathematics to show the failure of objectivism. The book is not easy to read in many places, but this is due to the complex and technical nature of the arguments analyzed, not the writing style. In general, Lakoff presents difficult material in a form accessible to the non-specialist.

The experientialist paradigm should prove especially interesting to Christians interested in integrating moral absolutes with the fact that our understanding is limited. Although Lakoff never discusses theology, he deals briefly with the place of ethics in experientialism. He also discusses how cross-cultural differences in cognition and categorization can be accommodated within an experientialist paradigm, and the implications of these differences for translation. Lakoff makes a forceful case for the claim that rationality and knowledge arise from the same basic interaction of observers with the world around them, whether the observer is a scientist, theologian, or preliterate peasant. As such, it has much to offer those interested in integrating the philosophy of science and theology.

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Letters

A Clinical Case of *Interlinear Hyperlexia*?

Arthur Strahler's letter (June 1990, p. 135) calling on the *Perspectives* editor and peer reviewers to "bow their heads in shame" sent me to the December 1989 issue to see what "unconscionable display of Christian bigotry" I had missed. Strahler was protesting "Christian chauvinism" in Armand Nicholi's "How Does the World View of the Scientist and the Clinician Influence Their Work?" (Dec. 1989, pp. 214-220).

Nicholi's article (a lecture addressing Christian scientists and clinicians) exhorted Christians to follow some explicit "marching orders" for doing clinical work, but did not categorize the treatment of patients by others. It called the *agape* standard "a unique kind of love," yet I found no argument that *agape* love is given exclusively to, exercised exclusively by, or expected exclusively from, Christian believers. Strahler must have read into the lecture his own inference about the behavior of "non-Christian (secular, humanistic)" therapists, to which no reference was actually made. Athough Sigmund Freud's self-definition as an "infidel Jew" was cited, Nicholi offered not the slightest hint that in treating patients Freud was "at best indifferent and at worst cruel, inhumane, and uncaring" (Strahler's words). Strahler read between the lines an implication that "Christianity is unique in generating compassion and sympathy."

The general tone of the letter and the name of the writer suggest that he may be the same Arthur Strahler who reviewed ASA's first *Search* issue (in *Creation/Evolution Newsletter*, May/June 1988, pp. 9-11). Strahler began

that review by criticizing what he didn't like about the ASA Statement of Faith, ASA's name, and a book coauthored by engineer Walter Bradley, who was the focus of that first *Search*. Then he turned to the way Bradley's story was told, pointing out in detail what the *Search* author had intended, his "wary" strategies, deplorable debating tactics, and "that nasty fallacy of homogenization" of science and religion. Noting that the author of *Search*, Walter R. Hearn, was also on the committee that produced ASA's "controversial propaganda piece, *Teaching Science in a Climate of Controversy*," Strahler was not surprised that *Search* had turned out to be an "exercise in creationist pseudoscience." After all, he wrote, "Special creationists have only one tape and they play it over and over again."

The unblinking reviewer then demonstrated his ability to read between lines as yet unwritten. He anticipated "subsequent issues of *Search*, each dealing with a different topic from *Teaching Science*." Foreseeing Hearn's intentions, Strahler felt safe in concluding that, "like this first issue, none of them should be allowed to gain admission to our public school science classrooms." He may have missed subsequent *Search* issues on an audio engineer, a psychologist, two chemists, and a geneticist, but he should have seen issue No. 7. Bound into the December 1989 *Perspectives* containing the Nicholi article, that *Search* focused on geologist Davis Young and his criticisms of the young-earth "creation science" movement.

Of course, between the lines, it may have said something entirely different to Arthur Strahler.

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"Word Maze" Feedback

You have requested feedback on the "Word Maze" feature. While I skimmed the first two, the column in the March 1990 issue caught my eye in particular. I am a student at Golden Gate Seminary, taking this semester, among other courses, Old Testament Theology, Introduction to Christian Ethics, and Lifespan Human Development. Dr. Bube's discussion was a wonderful synthesis of material related to all three areas. I am sharing the article with two professors now, and may pull it out again later. Having grown up exposed to the Greek trichotomous view, putting humans back into unity is most helpful. An issue that Dr. Bube did not touch on, but which must relate, is whether certain conditions, formerly named as sin and now thought of as illness (ie. alcoholism) are spiritual or merely physical. In truth, they are both and cannot be separated any more than a human being can be divided and still be human. The import for ethics is incredible when the words of the Bible are so understood.

Needless to say, this was a valuable article. Keep up the good work!

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P.S. With my background in geophysics, I thoroughly enjoyed "William Buckland in Retrospect"; doubly, since I took a class at the University of Calgary and once lived near where the author resides.

Further response to "Word Maze"—*Soul/Spirit*

When I saw that the "Word Maze" column in the March, 1990 issue of *Perspectives* was about the words "soul" and "spirit," I anticipated an informative discussion of the difference between these two concepts, a topic which is very interesting and also apparently quite important in light of the discussion in I Corinthians 15 of the two types of bodies which are designated by the adjective forms of these two words.

Instead, I found a discussion which seemed to deny the existence of entities that leave the body at death. Professor Bube pointed out that his view affects the question of the morality of abortion. It would appear that other specific issues affected by such a view are those of infanticide and euthanasia.

Certainly the words for "soul" and "spirit" in the Biblical languages have a broad range of meanings, including life, breath, and wind. There are, however, a number of instances when these words, especially "spirit," are apparently used in the Scriptures to indicate entities existing apart from a body. Some of these are Luke 8:55, Luke 23:46, Acts 7:59, I Corinthians 5:5, James 2:26, Revelation 6:9, and Revelation 20:4. The Scriptures also contain numerous references to the casting out of evil or unclean spirits. We are told in Acts 23:8,9 that the Sadducees did not believe in spirits. The context makes it seem unlikely that they were rejecting the concept of spirit put forth in the "Word Maze" column.

In summary, there appears to be ample evidence that the Scriptures teach the existence of entities that continue to exist after the death of the body in which they had resided.

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The American Scientific Affiliation

Founded in 1941 out of a concern for the relationship between science and Christian faith, the American Scientific Affiliation is an association of men and women who have made a personal commitment of themselves and their lives to Jesus Christ as Lord and Savior, and who have made a personal commitment of themselves and their lives to a scientific description of the world. The purpose of the Affiliation is to explore any and every area relating Christian faith and science. *Perspectives* is one of the means by which the results of such exploration are made known for the benefit and criticism of the Christian community and of the scientific community.

Canadian Scientific & Christian Affiliation

A closely affiliated organization, the Canadian Scientific and Christian Affiliation, was formed in 1973 with a distinctively Canadian orientation. The CSCA and the ASA share publications (*Perspectives on Science & Christian Faith* and the *ASA/CSCA Newsletter*). The CSCA subscribes to the same statement of faith as the ASA, and has the same general structure; however, it has its own governing body with a separate annual meeting in Canada.

LOCAL SECTIONS

of the ASA and the CSCA have been organized to hold meetings and provide an interchange of ideas at the regional level. Membership application forms, publications, and other information may be obtained by writing to: American Scientific Affiliation, P.O. Box 668, Ipswich, MA 01938, USA or Canadian Scientific & Christian Affiliation, P.O. Box 386, Fergus, ONT N1M 3E2, CANADA.

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